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Abou Bekr Belkaid University –Tlemcen-

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The effect of financial derivatives usage on cost of equity capital of commercial banks from GCC countries: An empirical study from 2006 to 2018

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Submitted by:
BENDIMA Nesrine

Supervised by:
Prof. BENBOUZIANE Mohamed
Co- supervisor:
Dr. BENDOB Ali

Jury members:

Prof. DERBAL Abdelkader (University of Oran)	**President**
Prof. BENBOUZIANE Mohamed (University of Tlemcen)	**Supervisor**
Dr. BENDOB Ali (University of Ain Temouchent)	**Co-supervisor**
Prof. BOUTELDJA Abdennacer (University of Tlemcen)	**Examiner**
Dr. ZERRAR Soumia (University of Tlemcen)	**Examiner**
Prof. BENSAID Mohamed (University of Sidi Bel-Abbes)	**Examiner**

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DEDICATION

My first acknowledgement goes to Allah for blessing me to succeed in doctorate test in the first, and after to allowing me to finish this thesis.

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ABSTRACT

Abstract:

After the globalization and markets integration, many changes have influenced both financial and banking sectors. Hence, in order to adapt with these changes the derivative instruments were created and they knew a rapid growth. Using the annual data of 25 commercial banks from GCC countries covering the whole period from 2006 to 2018 additionally to daily market data during the period 2010 to 2018, the objective of this thesis is to investigate mainly whether the use of financial derivatives makes banks reducing their cost of equity capital. In addition, this thesis also examines the effect of financial derivatives usage on both performance and risk of banks. Main results reveal that the use of derivative instruments lowers both performance and risk of commercial banks. Moreover, findings also show that the cost of equity capital in commercial banks is reduced due to the use of financial derivatives by these banks.

Keywords: Derivative instruments, performance of banks, bank risks, cost of equity capital, Panel data analysis.

الملخص:

لقد تأثر كلا من القطاع المالي و القطاع البنكي بعد التغيرات التي سببتها العولمة و تكامل الأسواق المالية، و للتأقلم مع هذه التغيرات ظهرت المشتقات المالية و زاد استعمالها عبر السنوات. باستعمال بيانات سنوية من 2006 إلى 2018 ل 25 بنك تجاري من دول الخليج بالإضافة إلى بيانات أسعار السوق اليومية خلال الفترة 2010 إلى 2018، تهدف هذه الأطروحة إلى معرفة إذا كان استعمال المشتقات المالية يخفض من تكلفة الأموال الخاصة في البنوك بالإضافة إلى دراسة تأثير استعمال المشتقات المالية على أداء و مخاطر البنوك. تظهر نتائج الدراسة أن استعمال المشتقات المالية من طرف البنوك التجارية يؤدي إلى تخفيض المخاطر التي تواجهها هذه البنوك ولكن في نفس الوقت يقلل من أدائها. كما تظهر النتائج أن تكلفة الأموال الخاصة في البنوك التي تستعمل المشتقات المالية قليلة.

الكلمات المفتاحية: المشتقات، أداء البنوك، مخاطر البنوك، تكلفة الأموال الخاصة، بيانات بانل.

Résumé:

Après la mondialisation et l’intégration des marchés, de nombreux changements ont influencé les deux secteurs financier et bancaire. En réponse à ces changements, les instruments dérivés ont été créés connaissant par la suite une croissance rapide. Dans cette thèse, notre objectif est double, en effet nous visons à examiner en premier lieu si l’utilisation des dérivés financiers permettrait de réduire les couts des fonds propres des banques commerciales, et en deuxième lieu l’effet de leur utilisation sur la performance et le risque de ces institutions ; et ce en utilisant à la fois les données annuelles de 25 banques commerciales des pays du golfe couvrant toute la période allant de 2006 à 2018, et des données de marché quotidiennes au cours de la période 2010 à 2018. Les principaux résultats révèlent que l’utilisation d’instruments dérivés réduit à la fois la performance et le risque des banques commerciales. En outre, les résultats montrent également que le coût des fonds propres des banques commerciales est réduit en raison de l’utilisation des dérivés par ces banques.

Mot clés: instruments dérivés, performance des banques, risques bancaires, coût des fonds propres, analyse des données de Panel.

TABLE OF CONTENTS

List of Tables

List of Figures

Introduction

I. Introduction:

Since the 1990s, there has been an accelerated globalization of capital markets, a global integration of the financial system and the expansion of capital markets. Hence, the financial markets have become more volatile due to changes in both the domestic and international financial markets.

In the fixed exchange rates during the Bretton Woods agreements, the worries about exchange rates and interest rates were little. After the fall of the Bretton Woods agreements in 1973, the exchange rates systems become floating. This marked the beginning of a period of exchange rate volatility and large movements in interest rates, inflation, trade conflicts and crises. This transformation and the rapid integration of the international financial markets have created the adverse effects of these fluctuations on firms' performance all over the world. Hence, firms face risks and it was necessary to measure the exposure to the risk in order to manage it. Consequently, risk managements become an important element to firms. One of the risk management tools that were invented to hedge risks is financial derivatives which are basically in the form of forward, futures, swaps and options whose payoffs is derived from primitive financial assets.

As a part of the financial and economic system, the banking system is under the influence of changes such as interest rates fluctuations, the increase of competition, the concentration of capital etc. In order to adapt with these changes, the banking sector tried to diversify its activities and one of its new activities is the use of financial derivatives.

At that time, many financial crises have happened such as the Mexican crisis 1994, Southeast-Asian crisis 1997, Russian crisis 1998 and American subprime crisis 2007-2008 etc. As a result of these crises, many banks have failed and witnessed big losses around the world (Lehman Brothers; Merril Lynch, Northern Rock, Goldman Sachs, HSBC, Fortis etc.)

Financial derivatives are contracts in which their value is based on more primitive assets. In general there are four types of derivative contracts forwards, futures, options and swaps. The use of forwards and futures can hedge an existing market exposure while the use of options is in order to obtain downside protection to an exposure even while retaining upside potential. By using swaps, it can transform the nature of an exposure. In addition to these types, another type of financial derivative is also widely used credit derivatives in order to obtain insurance against events such as default. According to **(Sundaram, 2012)** financial derivatives are also highly levered instruments which make them attractive to speculators.

(Mohamed Keffala, 2012) argue that banks are motivated to use financial derivatives to hedge from risks and uncertainly of financial markets, also to create revenues besides to the traditional operations ones.

As a result to the advantages and benefits of financial derivatives, the derivative markets have grown rapidly in both advanced and emerging economies. The notional amounts of OTC derivatives rose to 640 $ trillion at the end of June 2019. This rise is the highest since 2014. As for the gross market value of OTC derivatives, it has augmented from 9.7 $ trillion to 12.1 $ trillion in 2019. **(https://www.bis.org/statistics/rpfx19.htm)**

As financial markets integration, financial risk management becomes an indispensable function in many institutions over the past decades. It is a key concept in finance. Firms around the world find the need to hedge against the fluctuations in asset prices and other risks and one of the recent risk management tools are financial derivatives contracts. When these contracts are used properly, they create value for the shareholder; reduce the volatility of the cash flows and accounting profit. Thus, their use allows companies to pay a regular dividend **(Butler, 2009)**. As a result, risk management with financial derivatives has attracted much attention recently and becoming an important topic in the financial literature.

In valuation and financial decision making, the cost of capital estimate is just important as the estimate of the expected amounts of income to be discounted or capitalized **(Pratt & Grabowski, 2008)**. Hence, it is an important indicator and it is strongly used by companies to take a whole host of decisions.

The cost of capital is the promised return from the company to get capital from the market. This rate is used to convert a stream of expected future income into an estimate of its present value. It is market driven and is a function of the investment to the particular investor. At best, past returns provide guidance but the cost of capital is forward-looking. **(Porras, 2011)**

As a part from the cost of capital, cost of equity is an important element for banks managers, regulators and investors as well. For bank managers, cost of equity is considered as a performance measure and it is used as a hurdle rate for capital budget decisions. For regulators, it helps to provide a benchmark for policies aimed to enhance further risk management and financial stability. As for investors, cost of equity capital is the required rate of return, it is crucial to value equity securities in the constructions of their portfolios **(Asal, 2015)**. Thus, the cost of equity capital is essential and significant element of decision making process of a company. It is very critical to manage and control capital and its costs of a firm especially during the financial instability.

By using financial derivatives, firms can have more diversified capital structure. Since financial derivatives are designed to be an instrument transferring risk, they are expected to lower the financial distress costs of firms **(Park & Kim, 2015)**. According to **(Gay, Lin, & Smith, 2011)** hedging can increase future expected cash flows by reducing the probability of financial distress and hence expected costs associated with financial distress. In addition, the theory of Modigliani and Miller 1958 support the fact that corporate financial activities like hedging are irrelevant if investors can replicate these activities by themselves. Practically, the use of derivatives for risk managements has known a rapid growth. **(Ahmed, Judge, & Mahmud, 2018)**

As market become more global, local investors are facing more risk than if they were free to invest internationally. Hence, they will have required rates of return for holding local stocks that are higher than the rates required by well-diversified global investors for holding the same stock **(Carey & Stulz, 2006)**. The volatility of financial markets may hurt companies' financial health since it directly affects their cash flow.

Although the importance of the cost of equity capital, most of literature studies excludes banks, consequently only few papers aimed to estimate the cost of equity capital for the banking sector. Moreover, the new regulatory framework of Basel III that requires banks to hold a higher proportion of equity capital requirements is pointed out as an important determinant of the cost of equity capital in the banking sector.

GCC countries are large oil exporters with fixed exchange rate regimes, which expose them to many risks with the volatility of oil prices, and their financial sector is generally dominated by the banking sector, they also have more developed financial markets than other Arabic countries and started to use financial derivatives for hedging purposes specially in banking sector to hedge from interest rates and exchange rate risks.

Hence, the growth and development of derivatives markets is happened together with the instability of international financial markets at the same time.

Regarding literature on financial derivatives, most of the previous studies on financial derivatives focused on the pricing of derivatives and other studies examined the effect of financial derivatives usage focusing on non-financial firms, while only few studies aimed to analyze the impact of the use of financial derivatives in the banking sector and the majority of these studies where on advanced economies although the rapid growth in derivatives markets in both advanced and emerging economies and the importance of the banking sector and its development. Consequently, it is necessary to examine the effect of derivatives usage in the banking sector by focusing on emerging countries.

The current work aims to fill this gap by analyzing the effect of financial derivatives usage the performance and risks of banks from Gulf Cooperation Council countries as emerging countries.

Some papers such as **(Allayannis & Weston, 2001); (Said, 2011)** studied the relationship between derivatives and firm’s value, and overall the results show that the use of financial derivatives tends to increase firm’s value by increasing their performance and efficiency.

Other papers, focused on derivatives usage and risks, **(Instefjord, 2005b); (S. Li & Marinč, 2014a)** find that derivatives enhance banks risks and destabilize the banking sector, while **(Au Yong, Faff, & Chalmers, 2009)** argue that derivatives reduce short term interest rate risks but non on long term in Asia pacific countries banks.

Contrary to these studies which did not separate between types of derivatives, **(Reichert & Shyu, 2003)**; **(Mohamed Keffala, 2012)** analyze the effect of each type of derivatives separately on banks risks. Where **(Reichert & Shyu, 2003)** focus only on US banks and find that options increase banks risks while swaps lower them, however, **(Mohamed Keffala, 2012)**; **(Mohamed Keffala & de Peretti, 2013)** combine between banks from both emerging and developed countries and concluded that except for options all derivatives types reduce capital market risks and the majority of chosen banks use forward and swaps so they are not at risk.

Most of the previous papers focus only on developed countries. Nevertheless, another study focusing only on banks from emerging countries **(M. R. Keffala, 2015)** concluded that using options and futures lessen bank stability unlike forwards and swaps, also the study of **(Bendob, 2015)** focusing on banks from GCC countries the results show that derivatives use reduce non-systemic risk and enhance their performance.

Moreover, other studies about the effect of derivatives usage on both risk and value **(Rivas, Ozuna, & Policastro, 2011)**; **(Bartram, xf, hnke, Brown, & Conrad, 2011)** the results show that using financial derivatives decrease risks and increase firm’s value. In contrast **(Fung, Wen, & Zhang, 2012a)** find that US insurance companies users of swaps maximize their market risks and minimize both performance and firm value. In addition, **(Mohamed Keffala, 2012)** reached to the fact that derivatives lower both banks performance and risks.

Furthermore, the purpose of this thesis is also to examine the effect of derivatives use in banks and their impact on cost of equity of these banks. Regarding literature little number of papers studied the effect of financial derivatives usage on firms cost of equity and they focused on non-financial firms. **(Gay et al., 2011)** chose a sample of US non-financial firms find that derivatives lessen financial distress risk thus it reduce cost of equity especially in smaller firms and firms using currency and interest rate derivatives. The same result in the study of **(Ahmed et al., 2018)** which shows that the use of financial derivatives reduces cost of equity and financial distress. Another study of (J. Chen & King, 2014) concludes that the cost of debt is lower in firms that uses financial derivatives. In their study **(Coutinho, Sheng, & Lora, 2012)** examine the relationship between derivatives usage and cost of capital of Brazilian non-financial firms and the results show a positive relationship between derivatives and firm's cost of capital before subprime crisis and then after the crisis it turns to a negative relationship because of the greater caution in their hedging operations.

To our knowledge, only the study of **(Deng, Elyasiani, & Mao, 2017)** focuses on the effect of derivatives usage and cost of debt in banks from US and the results show that the use of financial derivatives by banks tends to decrease their cost of debt.

Thus, due to the limited number of literature focusing on the developing countries and only on non-financial firms and the limited investigation into the effect of derivatives' usage on the cost of capital of commercial banks and to our knowledge none of the previous studies have studied the effect of financial derivatives usage on cost of equity capital of banks, our thesis intends to fill this gap by focusing only on banks (financial firms) contrary to previous studies and on emerging countries.

II. Statement of the problematic and research questions:

With the rapid growth of derivatives usage around the world and the global instability of banks following the recent financial crisis, it leads us to ask the question of risk in terms of derivative instruments. Given the importance of the stability of the banking industry, this work aims to explore if derivative instrument affect the cost of equity capital of banks, by asking the following problematic:

Does the use of financial derivatives decrease cost of equity capital in commercial banks from GCC countries from 2006 to 2018?

Under this problematic, we ask these sub questions:

1. What is the effect of financial derivatives usage on the performance of commercial banks?
2. Are commercial banks decreasing their risks by using financial derivatives?
3. Does the financial derivatives usage reduce cost of equity capital of commercial banks?

III. Hypotheses of the study:

1. Financial derivatives have a positive effect on banks performance.
2. Banks lower their risks by using financial derivatives.
3. The usage of financial derivatives reduces the cost of equity capital.

IV. The aims of the study:

1. Identifying the determinants of derivatives use in commercial banks.
2. Knowing whether the derivatives have a positive or negative effect on both performance and risk of banks.
3. Analyzing how cost of equity capital of banks is affected by using financial derivatives.

V. The importance of the study:

1. This research investigates the effect of derivatives on bank performance and risk and cost of equity capital of commercial banks from GCC countries.
2. This research focus on banks from emerging countries contrary to the most previous papers focusing only on banks from advanced countries.
3. The lack of papers studying empirically the effect of derivatives use on cost of equity capital in financial firms (so far the previous studies found are on non-financial firms).
4. A comparative study between commercial banks from GCC countries.

VI. Reasons for choosing this topic:

1. The lack of papers studying the use of derivative instruments by commercial banks from GCC countries.
2. To identify the effect of derivative instruments on cost of equity capital of commercial banks in order to fill the gap of this topic in literature.
3. The rapid growth of derivatives in international financial markets which transforms derivatives from hedging tools to gambling tools.
4. The correlation of this topic with my specialty banks and insurances.

VII. The limits of the study:

The limits of our study are variables derived from balance sheets of a sample of commercial banks from GCC using Bank Focus database, in addition to stock prices of banks obtained from Thomson Reuter's database and the market indexes of each stock markets of all GCC countries during the period from 2006 to 2018.

This period is chosen to study the issue due to the global effect of the recent financial crisis which started in United States of America in the end of 2007 and continued in 2008 with repercussion on the rest of the world and particularly on emerging countries. Moreover, in this period is marked by the decline in the US dollar exchange rate, also the instability of oil prices especially in 2008 which knew a great rise in oil prices, and lastly the conflicts in neighboring Arab countries.

VIII. The study methodology:

We adopted the descriptive analytical method in order to determine and adjust the concepts and definitions to enrich the theoretical side of the search and in the case study we followed the experimental method using "Panel Data Analysis". The empirical study was divided into three sections. The first section was deduced to study the effect of financial derivatives on banks' performance while the second section aimed to examine also the effect of financial derivatives on risks of banks. The third section aimed to analyze the effect of financial derivatives usage on bank's cost of equity capital.

In statistics and econometrics, the term panel data refers to multi-dimensional data frequently involving measurements over time. Panel data contain observations of multiple phenomena obtained over multiple time periods for the same firms or individuals.

The importance of panel data analysis:

- ✓ Control of individual variation which may appear in the one-dimensional data (individual or time) and that leads to change analysis results.
- ✓ Panel data characterized the content of greater than one-dimensional information therefore we get the largest and most degrees of significance.
- ✓ Allow to study the behavior of the individuals during time.
- ✓ Contribute to the reduction of the appearance of the problem of omitted variables resulting from the individuals unobserved.
- ✓ Taking into account the heterogeneity unobserved of the sample (individuals or time) individual effects or time effects.
- ✓ Panel data could be balanced when the number of observation is equal in all sample, and unbalanced otherwise.

Depending on the information in the financial statements of commercial banks according to "Bank Focus" and stock prices of these banks, it has been identified for the study the basic variables.

The study variables of the first section:

- The dependent variable is the financial performance of banks measured by stock returns and the accounting performance of banks measured by return on assets, return of equity, net interest margin and cost to income ratio respectively.
- The independent variables are as follow: the notional amount of derivatives divided on total assets, bank size, net interest margin, liquidity, credit risk, loan and leverage.

The study variables of the second section:

- The dependent variable is the capital market risk of banks measured by total risks, systematic risks and specific risks. In addition to accounting risks which were measured by leverage risk, liquidity risk and credit risk.
- The independent variables are: the notional amount of derivatives divided on total assets, bank size, net interest margin, liquidity, loan and credit risk.

The study variables of the third section:

- The dependent variable is cost of equity capital.
- The independent variables are as follow: the notional amount of derivatives divided on total assets, bank size, leverage, return on assets and return on equity.

IX. The structure of the study:

The research is divided into three chapters as follows:

First chapter, theoretical side has been divided to three sections. In the first section we presented the general concepts about financial derivatives, reasons to use financial derivatives and their markets. Then, we focused on the accounting treatment of derivatives. In the second section, we defined types of risks that bank face and how to manage these risks in addition to the performance measurement in banks. In the last section, we presented a general concept about the capital structure theories, cost of capital in general and cost of equity capital in particular.

Second chapter, entitled literature review, where we discussed the previous empirical and theoretical studies, models used, variables, samples and their results. This chapter is also divided into three sections where the first section was about literature on derivatives and performance, the second section was about derivatives and risk and the third section was about derivatives and cost of equity capital.

Lastly, the third chapter entitled the empirical study also divided to three sections. The first section aimed to analyze the effect of using financial derivatives on the performance of banks. The second section was about the effect of financial derivatives usage on banks' risk and the last section aimed to examine how cost of equity capital is affected by the usage of financial derivatives. The three sections were organized as follow: firstly we described the used data in the study and the sample of the study. After that, we defined the variables used in our regressions in order to present the empirical model of each section and its results using different tests. Lastly, after the estimation results we interpreted the obtained results and discuss them comparing with the theory and previous results of literature review.

X. The study difficulties:

1. The lack of papers studying the use of derivative instruments in commercial banks in emerging countries.
2. The difficulty of conducting field study to maintain the details of the topic.
3. Different accounting methods between countries in the treatment of financial derivatives accounting by including them in commitments "off-balance sheet".
4. The lack of data, which limited our study only on few years and banks.
5. The lack of data about derivatives, where we wanted to study each type of financial derivatives separately but due to the absence of this data we could not.
6. The lack of data also limited our study in the estimation methods of cost of equity capital.

Chapter One

Theoretical and Conceptual Framework

Introduction

With the rapid growth of derivative markets around the world as well as the global instability of markets in general and the banking sector in particular, managers focus on the question of whether the usage of financial derivatives is reducing or increasing both performance and risk of banks.

Regarding literature the effect of using financial derivatives in the banking sector generally increases performance of banks especially in developed economies ((Rivas et al., 2011); (Said, 2011); (Au Yong, Faff, & Chalmers, 2014); (Mohamed Keffala, 2019)). As for bank risk, (Brewer Iii, Minton, & Moser, 2000); (Minton, Stulz, & Williamson, 2005); (Mohamed keffala, De Peretti, & Chan, 2012); (González, Gil, Agra, & Santomil, 2015) find that derivatives instruments use reduce risks in banks. Overall, most of the previous studies focus on banks from developed countries especially from U.S.A.

In another hand, cost of equity capital is an important element for banks' managers, regulators and investors. As pointed by (Gay et al., 2011) hedging can increase future expected cash flows, thereby the probability of financial distress is reduced and consequently investors required return is also reduced.

Although the importance of the cost of equity capital, only few studies have investigated the relationship between financial derivatives and cost of equity capital and they only focused on non-financial firms such as the study of (Gay et al., 2011) (Coutinho et al., 2012); (Ahmed et al., 2018).

Hence, the purpose of this chapter of the thesis is to define the major fundamentals about financial derivatives in the first section while in the second section we describe types of risks that banks faces and how to manage these risks in addition to performance measurements of banks. The third section provides the important theories of capital structure, then brief definitions of cost of capital and cost of equity capital as well as their estimation method according to several theories.

Section I. Fundamentals about Financial Derivatives

Through a literature review, conceptual analyses are conducted in order to understand the basis of financial derivatives and to place this concept in the right context.

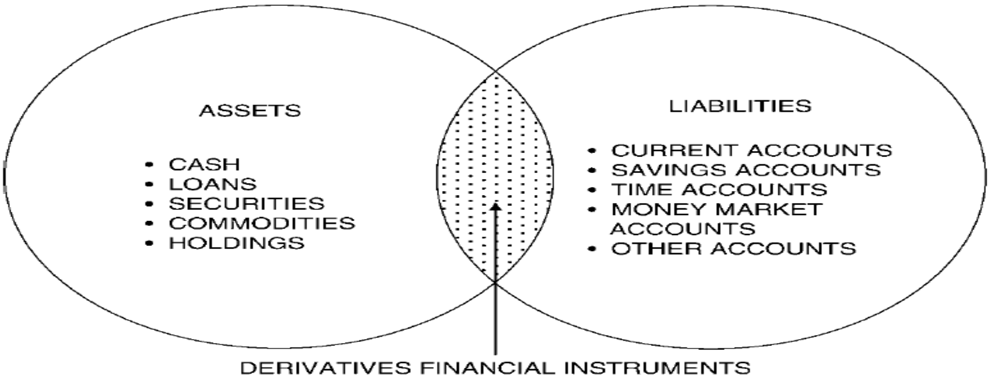
The main purpose of this section is to provide a conceptual framework about financial derivatives, their markets and users. Additionally, this section also presents how these contracts are priced and their accounting treatment will be illustrated.

I.1. Financial derivatives definition

The real beginning of financial derivatives was in the 1970's with profits and losses written in Off-Balance-Sheet (OBS). The Financial Accounting Standards Board (FASB) outlined 14 distinct classes that among themselves constituted the available derivatives there were commitments to extend credit; standby letters of credit financial guarantees written (sold), option written, interest rate caps and floors, interest rate swaps, forward contracts, future contracts, obligations on receivables sold, obligations under foreign currency exchange contracts, interest rate foreign currency swap, obligations to repurchase securities sold, outstanding commitments to purchase or sell at predetermined prices, and obligations arising from financial instruments sold short. Since then, the world of financial derivatives has known dramatic changes. In the 1990's the increased emphasis bankers and investors place on risk management, thus, these instruments are no longer minor Off-Balance-Sheet receivables and payables. They are integral parts of mainstream balance sheet (BS) activities.
(Chorafas, 2008, p. 30)

The following figure is adopted from **(Chorafas, 2008)** and represent the original binary balance sheet taxonomy of assets and liabilities after establishing there fair value, they should be places in the BS in the right side or the left side. On the assets side, when the investor makes a profit with it. While, when the investor loses money it will be on the liabilities side. The fair value of instruments is the value agreed by a willing buyer and a willing seller.

Figure (1.1): The original balance sheet taxonomy of assets and liabilities as enriched by a class of items that find a home only after their fair value has been established



Source: (Chorafas, 2008, p. 31)

At first place, we need to know the definition of a contract before defining a derivative contract. Hence, “a contract is s binding agreement between two or more parties to exchange specified goods or services on specified terms” **(Mamayev, 2013, p. 33)**

In 1988, the Financial Accounting Standards Board (IASB) defined derivatives in its statement of Financial Accounting Standards 133 (SFAS 133) as financial instruments which:

- ✓ “have one or more underlying and one or more notional amounts payment provisions or both;
- ✓ Required no initial net investment, and when this is needed it is smaller than hat called for with other instruments;
- ✓ Required or permit net settlements or provide for delivery of an asset that practically puts the buyer at a net settlement position”. **(Chorafas, 2008, p. 32)**

Moreover, **(Kwok, 2008, p. 1)** defines a financial derivative as a security whose value depends on the value of more basic underlying variables.

According to the International Financial Reporting Standards (IFRS) by the London-based International Accounting Standards Board (IASB) “a derivative is a financial instrument whose value changes in response to a change in the price of an underlying, such as an interest rate, commodity, security price or index”. According to **(Chance & Brooks, 2010, p. 4)** derivatives are based on the random performance of something and that is why the word derivatives is appropriate.

Another definition of **(Durbin, 2011, p. 1)** defined Derivatives as an agreement between a future buyer and future seller, or counterparties specified with a future price at which will be sold or not, in a future date where the transaction will occur and the underlie which could be a commodity, stock or government bond, an index…etc.

According to **(Kolb & Overdhal, 2010, p. 6)** a derivative contract is a delayed delivery agreement with a value derived from the value of another underlying assets where the delivery of this underlying is in the future. Therefore, the changing economic conditions in the delayed delivery can be more or less valuable for the contract counterparties.

As a conclusion to the previous definitions, derivatives instruments require no initial investment, or one that is smaller than would be needed in a classical contract **(Chorafas, 2008, p. 33)**.

Furthermore, the reason of calling derivatives derivatives is because the value of the underlier is derived from something else **(Durbin, 2011, p. 3)**, thus an underlier can be:

- ✓ Commodities: which are physical goods such as grains, meats and other foods, metals, energy goods. The majority of commodity derivatives are exchange traded at places.
- ✓ Currency meets: the currency market is the largest market where more than a trillion units of currency are bought and sold with the continuous changing in their prices. Currency is the most traded underlie in both OTC and exchange-traded market and for all sorts of derivatives.
- ✓ Money: “is bought and sold or rented. When a government or corporation issues a bond, it is simply borrowing money. The interest is the price of money to an issuer, which it pays to the bond holders according to the term of the bond. It is traded in the fixed rate of interest to their holders.” The interest rate derivatives are mostly traded in the OTC markets in sort of swaps and futures.

- ✓ Corporate equity or stock: a share of stock represents a silver of ownership in the company that issues it, and the stock market is a massive one. Options on stock trade heavily in both the OTC and exchange markets. **(Durbin, 2011, p. 11)**

I.2. Reasons for using financial derivatives

Derivatives are used basically for two reasons either for hedging purposes in order to manage uncertainty or for speculation in order to bet on. **(Durbin, 2011, p. 4)**

Before presenting the motives of using derivatives, the main question for the producer is to implement the appropriate hedging strategies in response to the changes in back wardation or contango.

- ✓ Back wardation: when spot prices are higher than long-term prices any hedge using a future maturity will be equivalent to a forward sale below the spot price leading to a loss if the market prices do not fall at the same rate.
- ✓ Contango: when spot prices are lower than long-term prices, the producer can sell the futures market at a higher price, thus the producer can fix his hedge and making profits if prices are not increasing at the same rate.
- ✓ Hedging using futures markets: in future markets, hedging price risk is like trading operations allowing one to transform a less acceptable risk into a more acceptable risk by engaging in an offsetting transaction in a similar commodity under roughly the same terms as the original transaction. Thus, when making a futures purchase any loss in the first transaction will be compensated by an equal gain in the offsetting operations. **(Bellalah, Prigent, & Sahut, 2008, p. 78)**
- ✓ Speculation using Futures markets: speculators enter the futures markets to make profits by taking the risk that hedgers avoid, therefore, they are sometimes in and out of the market several times a day because they hold onto their position for very short time.
- ✓ Arbitrage and spreads in futures markets: arbitrageurs enter the markets to buy the asset from one market and selling it in other market. If the prices move out the line they buy the under-priced asset in one market and sells the overpriced asset in another market. **(Bellalah et al., 2008, p. 85)**

I.3. Financial Derivatives Markets and Traders

Derivatives are traded in markets where a buyer and seller are together, so basically there are two basic types of derivatives markets. The first market is the exchanged market where derivative contracts can take the form of standardized contracts listed and traded on an exchange or bilateral agreements negotiated between counterparties in the over-the-counter (OTC) market. **(Kolb & Overdhal, 2010, p. 21)**

I.3.1. Over-The-Counter Market (OTC)

OTC is defined as the place where two parties find each other and then work directly with each other, without the need of a third part to formulate, execute or to enforce a derivative transaction, Thus, OTC is a market without a centralized exchange floor.

The most traded derivatives in this market are forwards and swaps. In OTC market when it comes time for execution the seller may decide not to sell, or the buyer may decide not to buy which means that there is no fundamental assurance in OTC markets. OTC markets can expose counterparties to substantial liquidity risk and credit risk**. (Kolb & Overdhal, 2010, p. 21)**

In addition, **(Gregory, 2014, p. 17)** pointed that the trade in OTC market is directly between two parties without an intermediary involved. The prices are negotiated between the dealer and the end user or between these two parties. OTC markets offer the ability to tailor contracts more precisely to client needs, where the key players are banks hedge funds and inter-dealer brokers.

I.3.2. The Exchange Market

The exchange market is the market which provides market maker who acts as sellers for those who want to buy and buyers for who want to sell thus a prospective buyer and seller can do a deal and not worry about finding each other which make these counterparties obliged to fulfill their responsibilities. The most common traded derivatives in exchange markets are futures and most options but not all. It should be mentioned that there is also derivatives markets where the traders do not even know they are trading derivatives. **(Durbin, 2011, pp. 6-7)** These markets are centralized structures with standardized traded contract that is organized to promote liquidity and to mutualize credit risk. **(Kolb & Overdhal, 2010, p. 21)**

According to **(Gregory, 2014, p. 11)** an exchange market "is a central financial center where parties can trade standardized contracts such as futures and options at a specified price". Financial products have been traded in these markets for many years. In a fact, an exchange market was developed to trade standardized contracts such as futures. Therefore, exchanges were trading forums without any settlement or counterparty risk management functions.

- Functions of exchange market

✓ Product standardization: the contracts which are traded in an exchange market are designed by this market where the maturity dates, minimum price quotation increments, deliverable grade of the underlying delivery location and mechanism are standardized.

✓ Trading venue: in exchanges market a physical or an electronic trading facility for the underlying products is provided, thus a central venue for trading and hedging is also provided. This centralized trading venue provides an opportunity for price discovery.

✓ Reporting services: in exchange markets there exist a great transparency of prices by providing a various reporting services of transaction prices to trading participants, data vendors and subscribers.

✓ Clearing: clearing is defined as the term which describes the reconciling and resolving of contracts between counterparties and takes place between trade execution and trade settlement. Clearing allow mitigating counterparty risk.

✓ Margining: margining involves exchange members receiving and paying cash or other asset against gains and losses in their positions. In addition, to provide extra coverage against losses in case they default.

- ✓ Netting: netting involves the offsetting of contracts which reduce the exposures of counterparties and the underlying network to which they are exposed. Thus, it reduces the costs of maintaining open positions. **(Gregory, 2014, p. 12)**

I.3.3. Financial derivatives traders

There are three main traders of derivatives:

- ✓ Hedgers: this type of traders uses derivatives to reduce risk that they face from potential future movement in market variables.
- ✓ Speculators: they use financial derivatives in order to bet on the future directions of the market variables.
- ✓ Arbitragers: this kind of traders takes off setting positions in two or more instruments to lock in a riskless profit if securities are inconsistently priced. **(Chance & Brooks, 2010, pp. 548-549)**

I.4. Role of Financial Derivatives Markets

Derivative instrument markets provide many advantages as presented below:

- ✓ Risk management: investors have different risk preferences; some are more tolerant to risk than others. However, all investors want to keep their investments at an acceptable risk level. Thus, derivatives markets enable those investors who want to reduce their risk to transfer it to those wishing to increase it.
- ✓ Price discovery: forwards and futures markets are important source of information about price. Because of the activity of these markets, the information taken from those markets is more reliable than spot market information, where future markets are considered a primary means to determine the spot price of an asset. Since the price of the future contract that expires the earliest referred to as the nearly contract is usually treated as the spot price. **(Chance & Brooks, 2010, pp. 12-13)**
- ✓ Operational advantages: in derivatives markets, the transaction costs are lower which makes these markets more attractive to investors to use than the spot markets. They also are more liquid or have greater liquidity than the spot markets. Moreover, derivatives markets allow to investors to sell short in an easier manner contrary to securities markets which impose several restrictions designed to limit the short selling.
- ✓ Market efficiency: spot markets are efficient where a few profitable arbitrage opportunities exist. However, even in markets that are usually efficient, the presence of these opportunities means that the prices of some assets are temporarily out of line with what they should be. Investors can earn returns that exceed what the market deems fair for the given risk level. The ease and low cost of transacting in derivatives market facilitate the arbitrage trading and rapid price adjustments that quickly erase these profit opportunities. **(Chance & Brooks, 2010, p. 14)**

However, Derivatives markets require the presence of speculators willing to assume risk in order to accommodate the hedgers wishing to reduce it. But, most of the speculators are more like gamblers because they do not deal in the underlying goods. Consequently, it leads the market into wildly speculative schemes. In derivatives markets, one party’s gains are another's losses putting an additional risk into the economy by allowing risk to be passed from one investor to another. **(Chance & Brooks, 2010, p. 17)**

I.5. Types of Financial Derivatives

Basically, the most common financial derivatives types are forwards, futures, options and swaps. Each type is defined separately to gain a better understanding.

I.5.1. Forward Contracts

A forward contract is an obligation agreement between two parties, when one of them promises to buy an asset from the second party with an agreed price and time in the future. **(Wilmott, 1995, p. 16)**

According to **(Durbin, 2011, p. 2)** a forward is a contract between a buyer and a seller where a buyer agrees to purchase the underlier from the seller at a specified price on a specified future date.

(Hirsa & Neftci, 2014, p. 4) defined forwards as a contract is said to be long in the underlying asset, and at the expiration date if the price is higher than the forward price agreed in the contract it means that the holder of this contract make a profit, otherwise there is a loss.

I.5.2. Future Contracts

A future contract is a contract like forward but usually traded in an exchange market, where the terms of the contracts are standardized which means that the profit or loss from the future positions is calculated every day and the change in this value is paid from one part to another. **(Wilmott, 1998, p. 16)**

Another definition of **(Durbin, 2011, p. 2)** where a future is a standardized forward contract executed at an exchange market where a buyer and a seller agree together and bring guarantees that both parties will fulfill their obligations.

Moreover, **(Fabozzi, 2002, p. 13)** "a future contract is an agreement whereby two parties agree to transact with respect to some financial instruments at a predetermined price at a specified future date".

Futures markets began in the mid-1800s in Chicago, where it started with grains as the underlying asset, while financial futures are based on financial instruments or financial index. The first financial future contracts were for foreign exchange and interest rate futures in the mid-1970s, while stock index futures where in the early of 1980s. **(Kolb & Overdhal, 2003, p. 4)**

Futures are similar to forwards but different in:

- They are traded in formalized exchanges where there is a design of a standard contract, while forwards are traded in the OTC markets, thus they are custom-made.
- In future contract, any profit or loss during the day is recorded in the account of the holder of the contract, so they are marked to market. **(Hirsa & Neftci, 2014, p. 5)**

I.5.3. Option Contracts

An option is an agreement which gives the holder the right to trade in the future at a specified price but without the obligation. There are basically two kinds of options call option and a put option.

- ✓ Call option is the right to buy a specific asset for a specified amount and time in the future.
- ✓ Put option is the right to sell an asset for a defined price in the future. **(Wilmott, 1998, p. 22)** According to **(Durbin, 2011, p. 2)** options are mostly executed at an exchange. But according to **(Kolb & Overdhal, 2003, p. 8)** they were traded Over-The-Counter before 1973.

A general definition of **(Kolb & Overdhal, 2010, pp. 13-14)** is that options are defined as "in a call (put) option contract the contract buyer has the right but not the obligation to purchase (sell) a fixed quantity from (to) the seller at a fixed price which is called strike price before a certain date which is the contract expiration date".
From the above definition we conclude that there is two type of option contract a contract buyer and a contract seller. In a "contract buyer" the buyer has the right but not the obligation to initiate an exchange while the seller is obliged to perform. The option buyer makes a non-refundable payment to the option seller called the option premium to obtain the rights of the option contract.

Options can be divided into caps, collars and floors:

- Cap: gives the purchaser protection against rising interest rates and sets limit on interest rates and amount of interest that will be paid.
- Floor: sets a minimum below which interest rates cannot drop.
- Collar: when purchasing a cap and simultaneously selling a floor, a bank gives up potential downside gain to protect against a potential up-side loss **(Beets, 2004, p. 62)**

Moreover, there exist several models to price options such as Black Scholes model, the Binomial model …etc. These models are estimated in order to calculate the Fair option contract premium.

In another hand, a call option buyer (seller) expects the price of the underlying securities to increase (decrease or stay steady) above the option exercise price. If not, the call option seller keeps the non-refundable payment the call option premium. For a put option buyer (seller) expects the price of the underlying securities to decrease (increase or stay steady) below the option exercise price. If so, the put option seller can exercise the right to sell the underlying instrument to the put option seller at the relatively high exercise price. If an option contract is held to expiration, the option may expire worthless, be exercised by the contract buyer or be sold for the difference between the contract exercise price and the market price of the underlying.

I.5.4. Swap Contracts

A swap is defined as a contract between one party and another to exchange future cash flows of one currency or differed currencies where the size of these cash flows is determined in the contract. The most popular used swaps are currency swaps and interest rate swaps. Another type of swaps is the vanilla interest rate swap which is an agreement where two parties swap cash flows where one part agrees to pay the second one a fixed interest rate and the opposite cash flow is a floating rate. It is common that this contract is usually used every six months. **(Wilmott, 1998, p. 419)**

Moreover, **(Marroni & Perdomo, 2014, p. 36)** defined swap as a contract that involves an exchange of cash flows or an exchange of cash for an asset over a specific period of time between two parties where at specified dates the two parties will exchange specific cash flows".

The first beginning of swap markets was in the late of 1970s, when currency traders developed currency swaps as a technique to avoid British controls on the movement of foreign currency. The first interest rate swap was in 1981 between IBM and the World Bank and since that the market of swaps has known a rapid growth especially because it provides flexible ways to manage financial risks. In addition, swap contracts are traded in the OTC markets, where the swap contract can be a foreign currency swap which includes the exchange of currencies or interest rates. This late is recently considered the most important swap contract. **(Kolb & Overdhal, 2003, pp. 11-13)**

Another type of derivatives is Credit derivatives which are defined as financial contract used by investors in order to manage credit risk exposure of their portfolios or asset holding by providing insurance against deterioration in credit quality of the borrowing entity and losses suffered due to credit events. If there is a technical default by the borrower or an actual default as the loan itself, and the bond is marked down in price, the losses suffered by the investor can be recouped in part or in full through the payout made by the credit derivatives. Credit derivatives are OTC products, thus they can be designed to meet specific user requirements.

(Eales & Choudhry, 2003, p. 101) define Credit risk as the risk that a borrowing entity will default on a loan, either through inability to maintain the interest servicing or because of bankruptcy or insolvency leading to inability to repay the principal itself". A credit risk can be measured by a firm's credit rating or using the credit risk premium which the difference is between yields on the same-currency government benchmark bonds and corporate bonds. Credit risk premium is the compensation required by investors for holding bonds that are not default-free**.**

I.6. The Uses of Financial Derivatives

Derivative instruments are used for the following purposes:

- ✓ **Risk management**: a derivative contract is a tool to reduce risk for its users.
- ✓ **To maximize return on investment:** using asset management activities, tax loopholes, and regulatory restrictions. For an example a company can use financial derivatives to produce temporary losses to lower its taxes. **(Finan, 2015, p. 547)**
- ✓ **Speculation:** derivatives provide a way to make bets that are highly leveraged (a potential gain or loss) on the bet can be large relative to the initial cost of making the bet.

- ✓ **Reduce transaction costs:** derivatives contract provides a lower-cost way to undertake a particular financial transaction.
- ✓ **Regulatory arbitrage:** trading a derivative contract allowed to circumvent regulatory restrictions, taxes and accounting rules. To achieve the economic sale of the stock by receiving cash and eliminating the risk of holding the stock and still maintaining physical possession of stock, this transaction may allow the owner to defer taxes on the sale of the stock or retain voting rights without the risk of holding the stock. **(Donald, 2013, pp. 12-13)**

According to **(Donald, 2013, p. 13)** the purpose of using financial derivatives varies by type of firms, for an example financial firms such as banks use interest rate derivatives, currency derivatives and credit derivatives to manage risks because they are highly regulated and have capital requirements, in addition they may also have assets and liabilities in different currencies with different maturities and with different credit risk. Moreover, derivatives can also be used to gain extra leverage for specialized market speculation when an investor believes that the market is going to move in a specific way. Thus, a larger profit can be made by investing in derivatives rather than in the underlying asset. **(Iori, p. 11)**

Moreover, we present the use of forwards and swaps in more detailed way to get a better knowledge in this vast concept.

I.6.1. Uses of Forwards

Forward contract are a common hedging product and are used by importers, exporters, investors and borrowers. They are used by those with existing assets or liabilities in foreign currencies and those wanting to lock in a specific future foreign exchange rate. It is important to know that there are risks when using forwards because of the time span, these risks are on a spot deal, credit risk, market or price risk and country risk. **(Shamah, 2003, pp. 53-54)**

I.6.2. Uses of foreign exchange swaps

Generally swaps are used to take advantage of imperfect exchange rate and interest rate differentials. They are also used where the domestic money market may not offer the necessary investment possibilities to hedge exposure.

(Shamah, 2003, pp. 73-74) swap risk and forward risk are identical, where a swap effectively becomes a forward once the near date has settled and the difference between them is a swap is that to do a swap there must be two transactions in opposite directions at different times.

I.7. Factors Affecting Financial Derivatives Prices

The most affecting factors on the prices of derivatives are the value of the underlying asset and the time to expiry. These two factors are variables which mean that they change during the life of the contract and if the underlying does not change then the pricing would be trivial. For an example, the interest rate will have an effect on the option value via the time value of the money, the payoff is received in the future, and about the strike price the higher the strike in a call, the lower the value of the call.

Another important factor is the volatility which is defined as the amount of fluctuations in the asset price, the technical definition of volatility is the annualized standard deviation of the asset returns. **(Wilmott, 1998, p. 30)**

I.8. Pricing Financial Derivatives

In order to price a derivative we need to find a function $f\ (S_t, t)$ that relates the price of the derivative product to S_t , the price of the underlying asset and possibly to some other market risk factors. S_t is defined as the price of the underlying asset and t is time. Hence, as pointed by **(Hirsa & Neftci, 2014, p. 56)** a financial analysts will try to obtain a closed-form formula for $f\ (S_t, t)$, and in case it does not exist, the analyst will try to obtain an equation that governs the dynamics of $f\ (S_t, t)$.

✓ **Forwards:**

S_t is the underlying asset where we consider a forward contract with the following provisions:

- At some future date T, where: $< T$; F dollars will be paid for one unit of gold, and the contract is signed at time t where no payment changes hands until time$T$. So, we have a contract that imposes an obligation on both counterparties the one that delivers the gold and the other who accept the delivery. Furthermore, using an arbitrage argument to determine a function $f\ (S_t, t)$ that gives the fair market value of such a contract at time t, we suppose one buys one unit of physical gold at time t for S_t dollars using funds borrowed at the continuously compounding risk-free rate r_t. r_t is assumed to be fixed during the contract period.
- Moreover, C is the insurance and storage costs per time unit and they are paid at time T. Hence, the total cost of holding this gold during a period of length $T - t$ will be given by:

$$e^{-r_t\ (T-t)}\, S_t +\ (T-t)\ C$$

- The first term is the principal and interest to be returned to the bank at time T, and the second term represent total storage and insurance costs paid at time T.

In forward contract, one signs a contract now for delivery of one unit of gold at time T and all payments will be made at expiration. An astute player will enter two separate contracts, buying the cheaper gold and selling the expensive one simultaneously giving the equality.

$$f\ (S_t, t) =\ e^{-r_t(T-t)} S_t +\ (T-t)\ C$$

This function is linear in S_t, thus the forward contracts are called linear products.

✓ **Boundary conditions:**

When we want to express the notion that the expiration date gets nearer we use the concept of limits:

We let $t \rightarrow T$

And $\lim_{T \to t} e^{r_t (T-t)} = 1$

Applying the limit to the left hand side of the previous expression and ignoring the presence of r_t which is a random variables beside to S_t, we obtained:

$$S_T = f(S_T, T)$$

Hence, at expiration the cash price of the underlying asset and the price of the forward contract will be equal. In addition, at the expiration date at the boundary for time variable t the pricing function $f(S_t, t)$ assumes a special value, S_t. Thus, the boundary condition is known at time t, although the value that S_t will assume at T is unknown. **(Hirsa & Neftci, 2014, pp. 56-58)**

- ✓ **Options:**

Suppose C_t is a call option written on the stock S_t, where r is the constant risk-free rate, k is the strike price, and $T, t < T$ is the expiration date. Then, the price of the call option is:

$$C_t = f\ (S_t, t)$$

In simplified conditions, S_t will be the only source of randomness that affects the option's price. Thus, unpredictable movements in S_t can be offset by opposite positions taken simultaneously in C_t. **(Hirsa & Neftci, 2014, p. 58)**

Furthermore, **(Ekstrand, 2011, p. 3)** concludes that the theory of derivatives pricing is based on a set $\{S^i\} = \{S^1, S^2, S^3 \ldots\}$ of predefined financial assets that can be stocks, bonds…etc. The price of an asset S is a real number which we also denote by S or by S_t when we want to emphasize the time dependence.

Assuming today's prices $\{S_t^i = 0\}$ are given and refer to these assets as the underlying of the theory. Hence, we want to price derivatives contracts V for which the prices at time T are known as expressions of the price S_t of an underlying. However, it is necessary to impose certain conditions on the underlying. First, we assume that the underlying is liquidly traded so we allow S_t being equal to any real value and the time period between purchasing an asset and the payment charge is "settlement lag" and it is set to zero for simplicity. Secondly, by entering futures or forwards contracts, assets can be shorted, consequently, we assume that the underlying is non-default able and that there is not any costs associated with holding the underlying such as storage costs and no cash flows generated by them such as dividends.
The third assumption is that the market is efficient and all market participants are assumed to have excellent credit rating meaning that they never default. Additionally, we impose that the zero coupon bonds $P_{t\,T}$ which measures the time t value of one dollar at T and is given for all$T$, as derivatives pricing involves discounting cash flows.

(Ekstrand, 2011, p. 4) stipulates that these assumptions are made only to obtain a theory because in real markets these assumptions are violated. However, they can be taken care of with minor adjustments to the theory.

I.8.1. The Pricing of Forward and Future Contracts

According to **(Kolb & Overdhal, 2010, p. 351)** pricing forward and futures contracts is under ignoring transactions cots meaning that you can buy and sell the underlying asset at the same price, go long and short the futures contracts at the same price and borrow and lend at the same interest rate. In addition, it is important to ignore taxes and the possible fail in abiding by the terms of the two counterparties. Moreover, we assume that markets operate sufficiently well that there are no arbitrage opportunities.

✓ **Cost of Carry model:**

When the underlying asset is a financial asset, Cash-and-Carry arbitrage is the foundation of the cost of carry pricing model. Where, the set of trades that build up cash-and-carry arbitrage is:

- Borrow;
- Buy the underlying asset;
- Sell (go short) a future contract.

Hence, this set of traders has the arbitrageur borrowing in one market and lending in another market. So, when buying an underlying asset is considered a loan which will be repaid in the delivery day plus an interest. Cash-and-carry arbitrage establishes a maximum futures price. Therefore, if this price is too high these trades will lead to an arbitrage profit. In contrast, cash-and-carry arbitrage sets a minimum futures price and if this price is too low it will lead to an arbitrage profit **(Kolb & Overdhal, 2010, p. 352)**.

According to **(Kolb & Overdhal, 2010, pp. 353-354)** we denote S as the spot price of the underlying asset, F as the future price, the subscript 0 denotes "today" and T the delivery day, r is the interest rate per year, T is the initial time until delivery.

Assuming that there is a continuous compounding so that the future value of a dollar that will be received at time T is e^{rT1}. When the initial future price is too high, the Cash-and-Carry arbitrage trades have you borrow to buy the spot underlying asset and sell the overpriced futures contracts. And regardless the delivery day there is no initial cash flow and the arbitrageur realizes a specific profit. In contract, if the initial future price is too low, reverse Cash-and-Carry arbitrage requires that you sell the underlying asset, lend the proceeds and buy the cheap futures contract. And the arbitrageur receives a specific cash inflow at the delivery day. Therefore, due to convergence, $F_T = S_T$, the future price must equal the spot price on the delivery day. Thus, in order to have no arbitrage opportunity, the future price must equal$F = Se^{rT}$.

✓ **Carry return:**

A Carry return is a monetary benefit from actually owning the underlying asset. This method will lower the futures price relative to the spot price. Contrary to a carry cost, which it increases the futures price relative to the spot price. For stock index futures, or a futures contract on a dividend-yielding stock, d is defined as the annualized dividend yield. Thus, the theoretical futures price is:

$$F = Se^{(r-d)T}$$

It is necessary to note that this model works best when dividends are paid smoothly by the stocks in the index during the life of the futures contracts.

In discrete terms, the theoretical futures pricing model for a dividend paying stock or stock index is:

$$F = S(1+r)^T - FV\ (divs)$$

Where $FV\ (divs)$ is the future value of the cash dividends paid between now and the delivery. Equivalently, this discrete model is:

$$F = [S - PV\ (divs)](1+r)^T$$

$PV\ (divs)$ is defined as the present value of the dividends paid prior to the delivery.

For a foreign currency, the theoretical futures price is:

$$F = Se^{(r-F)T}$$

Where: F is the foreign interest rate and r is the domestic interest rate.

It should be mentioned that there is another Carry return model which is used to price futures contract of commodities and it is called "The lease rate". It is used when the owner of the underlying asset lend it to someone and be repaid "interest" in the form of additional product. **(Kolb & Overdhal, 2010, p. 355)**

- ✓ **Commodity futures:**

In addition to Cary cost, other Carry costs are relevant for commodities, such as the costs of storing and insuring the commodity so the futures pricing model is:

$$F = Se^{(r+c)T}$$

Where: c is the future value of the spot price that must be paid to store the underlying asset until the delivery. And if c is the present value of all of the physical storage costs then: **(Kolb & Overdhal, 2010, p. 356)**

$$F = (S+C)\ e^{rT}$$

- ✓ **Convenience yield:**

The convenience yield is the concept that reconciles this reluctance or inability to sell (short) with the reality of futures pricing. Hence, the convenience yield is the unobservable variable that measures the marginal benefit of owning the underlying asset. Because of a reverse Cash-and-Carry arbitrage not taking place, the convenience yield lowers the futures price, then:

$$F = Se^{(r-y)T}$$

Where: y is the convenience yield as a percentage of the price of the underlying asset.

In case storage costs and the convenience yield are both relevant the model to estimate commodity futures price is: **(Kolb & Overdhal, 2010, p. 357)**

$$F = (S+C)e^{(r-y)T}$$

- ✓ **Delivery options:**

Futures contracts of corn, soy beans, wheat, crude oil and treasury bonds and notes convey delivery options to the seller giving him:

- A range of delivery dates to make delivery "a timing option".
- A choice of exactly what type, grade, quality of the underlying asset that will be delivered " a quality option".
- The ability to decide to make delivery at time t and receive a payment based on the closing futures price that existed hours or even days prior to time t.
- A range of delivery locations where the underlying asset will be delivered "a location option".

It is better to be short futures than long futures, because it allowed owning these options. **(Kolb & Overdhal, 2010, pp. 357-358)**

According to **(Eales & Choudhry, 2003, pp. 31-32)** when a forward contract is written, its delivery price is set so that the present value of the payout is zero. Moreover, it is important to know that the forward price of a contract is not the same as the value of the contract and the terms of the agreement are set so that at inception the value is zero.

However, the price of a forward and a future contract might be identical under these following conditions:

- The absence of risk-free arbitrage opportunities;
- The existence of an economist's perfect market;
- Certainty of returns. **(Eales & Choudhry, 2003, p. 34)**

I.8.2. The Pricing of Swap Contracts

The swap price refers to an interest rate which is used to determine the fixed rate payments of the swap. If we considered we have two bonds where the first bond has a fixed rate coupon while the second bond features a floating rate coupon. So, values for the fixed rate bond B^{fix}, and the floating rate bond B^{flt} are determined as shown:

$$B^{fix} = \sum_{t=1}^{n} \frac{\bar{c}}{(1 + \ {}_0R_t)^t} + \frac{F}{(1 + \ {}_0R_n)^n}$$

$$B^{flt} = \sum_{t=1}^{n} \frac{\tilde{c}}{(1 + \ {}_0R_t)^t} + \frac{F}{(1 + \ {}_0R_n)^n}$$

All cash flows are discounted by a unique zero coupon rate corresponding to the specific timing of the cash flow. In another hand, swap valuation is different from swap pricing. First, considering V the values of a swap, the value of receive fixed, pay floating swap:

$$V = B^{fix} - B^{flt}$$

Second, V is the value of a pay fixed, received floating swap:

$$V = B^{flt} - B^{fix}$$

According to **(Kolb & Overdhal, 2010, pp. 407-408)** to price the swap we recognize two key points: firstly, at its inception, the value of a fairy priced swap is zero. Secondly, the value of a floating rate bond at either issuance or upon any reset date is its par or face amount. If we assume the paramount equals to one dollar:

$V = B^{fix} - B^{flt} = 0\ \$$

$$B^{fix} - 1\$ = 0\ \$$$

Thus:

$B^{fix} = 1\$$

Hence, the price of a swap will be the coupon rate that makes the fixed rate bond have a value equal to that of the floating rate bond as a result the initial swap value to equal to zero. Furthermore, in **(Kolb & Overdhal, 2010, p. 410)** to price and value swaps, we have the following steps:

- Obtain market inputs;
- Make convexity adjustments to implied futures rates;
- Build the zero curve;
- Identify relevant swap features;
- Price / value the swap.

Pricing a currency swap which is defined as an interest rate swap where in the two series of cash flows exchanged between counterparties are dominated in two different currencies. Hence, the interest payments can be in a fixed-for-floating, fixed-for-fixed, or floating-for-floating format.

To price these types of swaps, firstly the swap can be viewed as a portfolio of two bonds, a fixed rate bond and a floating rate bond, wherein one of the bonds is held long and the other is held short. Secondly, the initial value of the swap is zero since the value of the fixed rate bond equals that of the floating rate bond. Thirdly, the fixed swap rate is the coupon rate that makes the fixed rate bond sells at part.

For a value perspective, one would be indifferent between holding long or short either bond comprising the swap since both bonds have identical value equal to their par or notional principal amounts. The model will be:

$$B_0^{Dom} = B_0^{For} * S_0$$

Where: B_0^{Dom} is the initial value or principal amount of the bond having cash flows (fixed or floating) expressed in the domestic currency, B_0^{For} is the initial value or principal amount of the bond having cash flows (fixed or floating) expressed in the foreign currency, and S_0 is the current spot exchange rate (Dom/ For). **(Kolb & Overdhal, 2010, pp. 417-418)**

Another, type of swaps is a commodity swap which is prices as follow:

$$V = \sum_{t=1}^{n} \frac{\bar{C} - \tilde{C}}{(1 + {}_0R_t)^t}$$

$\bar{C}$ is the fixed price of the commodity which makes the overall value of the swap equal zero. That is, one solves for the value $\bar{C}$ that does not make the value of each of the n forward contracts equal zero but rather the sum of the value of all n forward contracts. **(Kolb & Overdhal, 2010, p. 419)**

Moreover, there exists another type of swaps which is swaptions. Swaptions are defined as options on swaps where the buyer of a swaption has the right but not the obligation to enter into an interest rate swap agreement during the life of the option. They are priced using the Black-Scholes or Black 76 option pricing models. Wherein, the value of a swaptions is the difference between the strike rate and the swap rate at the time it is being valued. **(Eales & Choudhry, 2003, pp. 91-92)**

I.8.3. The pricing of Options

The topic of pricing options is vast; we define the pricing methods of options in briefly way in order to gain a simplified understanding of each pricing model.

- ✓ **The Black and Scholes model**

The first appearance of Black and Scholes pricing model was in 1973 where it was developed by Fischer Black and Myron Scholes. The developers of the BS model made assumptions to their model as follow:

- The option is only exercisable at expiration;
- The market operates continuously;
- The share pays no dividend over the life of the option;
- The risk-free rate of interest is constant over the life of the option;
- There are no transaction costs, zero taxes and no bid-offer spread;
- The underlying share can be shorted without penalty and short-sellers receive the cash benefits from the short sale in full;
- Share prices are continuous and are not subject to precipitous changes in price either up or down-shares are assumed to follow an Ito process. **(Eales & Choudhry, 2003, pp. 189-190)**

Moreover, the price of the underlying contract must have a stochastic process, meaning that the asset pays no dividends and the risk free interest rate is a known constant and that the price dynamics are governed by a geometric Brownian notion. In addition, the markets where the underlying and options are traded are frictionless which means that it is possible to buy and sell any amount at any time and without incurring transactions costs **(Alexander, 2008, p. 174)**. Additionally, it is necessary that equity prices move according to a wiener process and if there is a series of small random movement in the share price the track that it is tracing can be assumed to be geometric Brownian notion and can be defined as:

$$dS = \mu Sdt + \sigma Sdz$$

Where:
μ: is constant and represents the expected return on the share reported as an annualized rate.
σ: is constant and represents the share's volatility reported as an annualized rate.
dt: represents a minute passage of time.
dz: represents term which generates randomness into the movement of the share price (S).
And if the randomness does not exist, dz equal to zero:

$$dS = \mu Sdt \quad or \quad \frac{dS}{S} = \mu \, dt$$

Integrating the above equation:

$$\int_0^T \frac{dS}{S} = \int_0^T \mu dt$$

The following is derived:

$$\ln S = C\mu T$$

C: is the constant of integration.

Furthermore, taking logarithms of both sides and setting C equal to the starting value of the share price:

$$S_T = S_0 e^{\mu T}$$

Assuming that the mean of dz is zero and the variance of dz is one so:

$$dS = \mu S dt + \sigma S \varepsilon \sqrt{dt} \quad or \quad \frac{dS}{S} = \mu dt + \sigma \varepsilon \sqrt{dt}$$

Where:

ε: is a random number drawn from the normal distribution with mean equals to zero and variance equals to one$N(0, 1)$. **(Eales & Choudhry, 2003, pp. 190-191)**

Hence, The B and S formula for the pricing of a call option is:

$$C(S, E, t, r, \sigma) = SN(d_1) - Ee^{-rt}N(d_2)$$

And the price of a put option (P) is:

$$P = C - S + E\ e^{-rt}$$

Where:

S: is the current share price.

E: is the strike price.

t: is the time to expiration as a proportion of a year.

r: is the period effective risk-free rate of interest as a decimal.

σ: is the standard deviation of the continuously compounded annual rate of return on the share volatility.

log_e: represents logarithms to base e (natural logarithms). **(Eales & Choudhry, 2003, p. 198)**

$$d_1 = \frac{\left[log_e\left(\frac{S}{E}\right) + \left(r + \frac{\sigma^2}{2}\right) * t\right]}{\sigma\sqrt{t}}$$

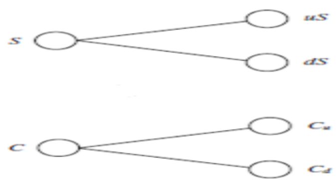
$$d_2 = \frac{\left[log_e\left(\frac{S}{E}\right) + \left(r - \frac{\sigma^2}{2}\right) * t\right]}{\sigma\sqrt{t}}$$

Or $d_2 = d_1 - \sigma\sqrt{t}$

- ✓ **The binomial pricing:**

This method provides a useful vehicle for gaining an insight into option pricing and hedging. And according to **(Back, 2005, p. 91)** the binomial method is appropriate for pricing American options. The following figure represents how an underlying security is priced according to this method.

Figure (1.2): The pricing of options according to the binomial method



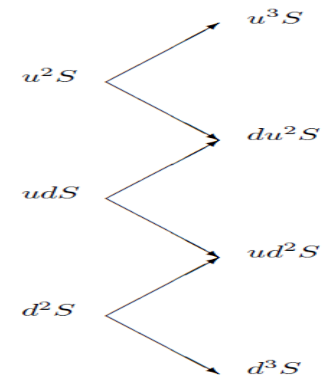
Source: (Back, 2005, p. 91)

In the above figure, the price of the underlying security S at the start will rise to a value of S multiplied by u or fall to a value of S multiplied by d. For option price it is similar where C is the initial price of a call option if S rises it will take a value of C_u.
C_u will be determined by using a modified version of the decision rule which describe the Black and Scholes model: $max[uS - E, 0]$. While the pay off C_d is determined as: $max[dS - E, 0]$.

For a put option, it is determined as $max[E - uS, 0]$ if S moves to uS or $max[E - dS, 0]$ if S moves to dS by the end of the period. **(Eales & Choudhry, 2003, p. 201)**
Furthermore, according to **(Back, 2005, p. 89)** if we assume that S is the stock price at the start of the period, at the end of the period, it will be either uS or dS where u and d are constants. This means that the rate of return in the up rate will be $\frac{\Delta S}{S} = u - 1$ or $\frac{\Delta S}{S} = d - 1$ in the down state.

Hence, there exist three parameters to the model: u, d and the probability P of the up state and $1 - P$ the probability of down state. The following figure illustrates a three-period model. **(Back, 2005, p. 96)**

Figure (1.3): The pricing of options according to the binomial method: a three-period model



Source: (Back, 2005, p. 96)

To value a path-dependent option in an N-period binomial tree require the analysis of 2^N separate paths which is faster in Monte Carlo Method.
From the binomial tree and in order to price the option we need to calculate the option value at each node from the first node as C (0) to the next C (1)… etc. Thus, at each node it might be a down move or an up move. So, the option value is calculated as:

$$C = e^{-r\Delta t} p\, C_{up} + e^{-r\Delta t}(1 - p) C_{down}$$

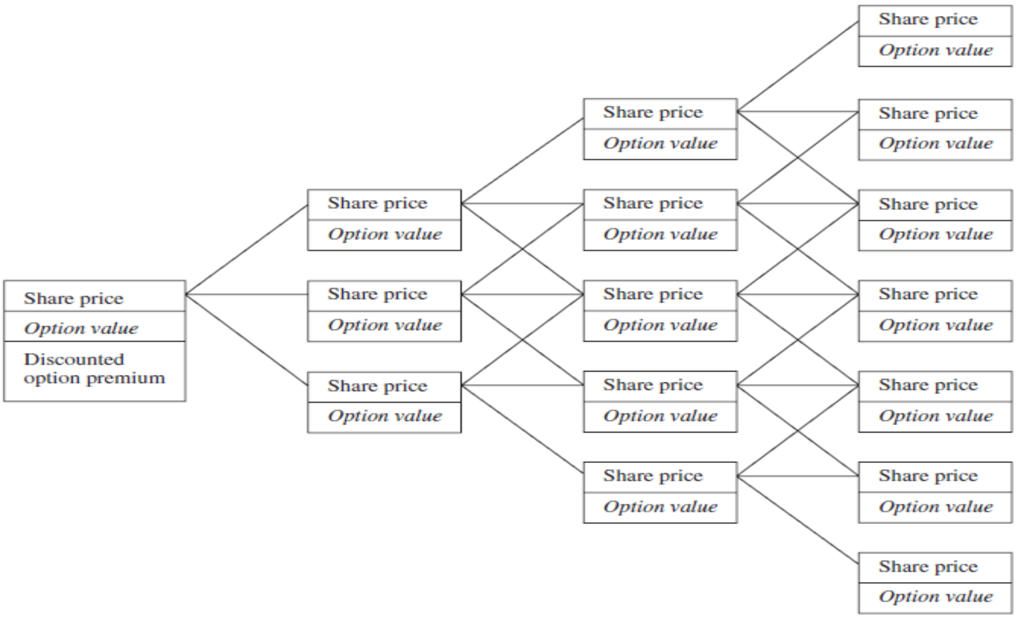
In addition, the down move is i and from the up move is $+1$, then: **(Back, 2005, p. 91)**

$$C(i) = e^{-r\Delta t} p\, C(i + 1) + e^{-r\Delta t}(1 - p)\, C(i)$$

In another hand, there is another method similar to binomial method which is called "Trinomial pricing method" which is a trinomial tree which has not just an up and down movement like binomial method but also m movement which is defined as being no change in price which will allowed to increase the number of nodes compared to binomial tree. **(Eales & Choudhry, 2003, pp. 211-212)**

The following figure represents a Trinomial Tree adopted from **(Eales & Choudhry, 2003, p. 213)**

Figure (1.4): The trinomial tree for pricing options



Source: (Eales & Choudhry, 2003, p. 213)

If N is used to denote the total number of nodes in the binomial tree the generate a total of $(N^2 + 3N + 2)/2$ nodes compared to $(N^2 + 2N + 2)$ in the trinomial tree. The following equation is used to calculate the aggregate number of nodes in the Trinomial model:

$$\frac{N^2 + N}{2}$$

After calculating the number of required nodes, we need to determine the probability of up, down and no change moves by defining the parameter λ as follow:

$$\lambda = \frac{h^2}{\sigma^2 k}, k = \frac{T}{N}$$

Then, the probabilities are:

$$P_u = 0{,}5 \left[\sigma^2 \frac{K}{h^2} + \gamma^2 \frac{K^2}{h^2} + \gamma \frac{K}{h}\right]$$

$$P_u = 0{,}5 \left[\sigma^2 \frac{K}{h^2} - \gamma^2 \frac{K^2}{h^2} - \gamma \frac{K}{h}\right]$$

$$P_m = 1 - P_u - P_d = 1 - \frac{1}{\lambda}$$

Where $\gamma = (r - d - \sigma^2/2)$

σ: is constant and represents the share's volatility reported as annualized rate.

σ^2: represents the daily variance expressed of returns.

r: is the period affective risk-free rate of interest as a decimal.

γ: is the standard deviation of the continuously compounded annual rate of return on the share volatility.

Furthermore, the number of ways of up, down and no change moves is:

$$\frac{n!}{i!\,j!\,(n-i-j)!}$$

Where:

n: is defined as the number of steps.

i: is the number of up moves.

j: is the number of down moves.

Hence, the trinomial model will be as follow: **(Eales & Choudhry, 2003, pp. 213-214)**

$$C = e^{-nr\Delta t}\left[\sum_{i=0}^{n}\frac{n!}{i!\,j!\,(n-i-j)!}\,P_u^i\,P_m^{(n-i-j)}\,P_d^j\,\left((\exp(\ln S) + (i_u - j_d)h(S-E)\right)\right]$$

- ✓ **The Monte Carlo simulation:**

The value of a security paying an amount x at date T is:

$$e^{-rT}E^R[x]$$

Hence, to estimate the value of a security using a Monte-Carlo we need to simulate a sample of values for the random variable x and to estimate the expectation by averaging the sample values. This sample must be generated from a “population” having a distribution consistent with the risk-neutral probabilities such as European options under the Black-Scholes assumptions. **(Back, 2005, pp. 87-88)**

In case of a call option: x is $max(0, S(T) - K)$. So to simulate a sample of values for this random variable we have to simulate the terminal stock price $S(T)$.

Moreover, according to the Black-Scholes assumptions, the logarithms of $S(T)$ is normally distributed under the risk-neutral measure with mean $\log S\,(0) + VT$ and variance $\sigma^2 T$, where $V = r - q - \sigma^2/2$.

Then, we can simulate values for $\log S\,(0) + VT + \sigma\sqrt{T z}$, where z is a standard normal. After that, we can average the simulated values of $max(0, S(T) - K)$ then discount at the risk-free rate to compute the date -0 value of the derivatives. Meaning that, we generate some number M of standard normal Z_i and estimate the option value as $e^{-rT}\bar{x}$, where $\bar{x}$ is the mean of: $x_i = \max\left(0, e^{\log S(0)+VT+\,\sigma\sqrt{T}\,Z_i} - K\right)$.

According to **(Eales & Choudhry, 2003, p. 217)** in order to speed up the process of Monte-Carlo simulation, many variations have been developed such as the use of antithetic variables by generating on evaluation of the share price which is the mirror image of the original set of random numbers, and control variables which is the conjunction of a benchmark information from an outside source with a simulation. And lastly a bootstrap simulation does not require estimation of parameters like mean and standard deviation from a historical time series of an underlying security.

However, the Monte-Carlo method has some drawbacks. Firstly, it is difficult to value early-exercise features because we need to know the value at each date if not exercised. Contrary to binomial model which can easily defined early exercise although it has difficulty in identifying the path dependencies. Secondly, Monte-Carlo methods can be quiet inefficient in terms of computation time. **(Back, 2005, p. 88)**

It is known that the standard error of the estimate depends on the sample size for an example a random sample $(x_1, \dots x_M)$ of size M from a population with mean μ and variance σ^2. The best estimate of μ is the sample mean $\bar{x}$ and the standard error of $\bar{x}$ is best estimated by:

$$\sqrt{\frac{1}{M(M-1)}\left(\sum_{i=1}^{M} x_i^2 - M\,\bar{X}^2\right)}$$

$\bar{x}$ plus or minus 1,96 standard error is 95% of confidence interval for μ when the x_i are normally distributed. While in European option valuation, the previous equation gives the standard error of the estimated option value at maturity and the multiplication of this equation by e^{-rT}gives the standard error of the estimated date -0 option value. **(Back, 2005, p. 88)** Furthermore, the complexity of Monte-Carlo method arises from trying to reduce the required sample size while in order to obtain an estimate with an acceptably small standard error require a large sample size. **(Back, 2005, p. 89)**

Another approach in pricing options was developed by Mondher Bellalah, this approach is used when markets can make sudden jumps in the presence of incomplete information. By combining Derman et al (1991) model and Bellalah (1999) approach in order to include information costs, the option value is:

$$option = \omega\, BS\,(S_u, K, \sigma, r, \delta, \lambda_s, \lambda_c, T) + (1 - \omega)\, BS\,(S_d, K, \sigma, r, \delta, \lambda_s, \lambda_c, T)$$

Where:

$BS\,(S_u, K, \sigma, r, \delta, \lambda_s, \lambda_c, T)$ is the formula giver by Bellalah (1999).

In this context, the call value is given by:

$$C = S_{exp}(\lambda_s - \lambda_c)\,T)\,N(d_1) - E_{exp}(-(r + \lambda_c)T)\,N(d_2)$$

$$d_1 = \left[\ln\left(\frac{S}{E}\right) + \left(r + \lambda_s + \frac{1}{2\sigma^2}\right)T\right]/\sigma\sqrt{T}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

Where:
S: is the underlying asset price.
E: is the strike price.
λ_s: is the information cost on the asset$S$.
λ_c: is the information cost on the asset$C$
T: The time to maturity.
r: The riskless interest rate.
σ: The volatility of the underlying asset. **(Bellalah et al., 2008, pp. 4-5)**

I.9. The Accounting Treatment of Financial Derivatives

The IFRS and IAS were created in order to safeguard investors by achieving transparency and uniformity in the accounting principles and one of the challenges they face is the accounting treatment of financial derivatives especially since it is linked to risk management.

I.9.1. The Accounting Treatment before IAS 39

Before IAS 39, derivatives contracts were kept under off-balance sheet, where according to IAS 2.28 the value of the hedged asset must be recorder at the lower of cost or net realizable value in the balance sheet. Therefore, the value of the hedged asset is above cost, where the cost is used as opposed to the fair value. Hence, the profit made from the derivatives contract is kept on the derivative off the balance sheet because the standards do not allow recognizing the profit on the underlying. However, some creative accounts developed an accounting methodology which allowed them to recognize the gain on the derivative contract without recognizing the reduction in value on the underlying. This methodology was to cash in the derivative at 31 December and taking the received cash to the Profit and Loss account. Moreover, these accountants avoid cashing in loss-making derivatives, thereby losses were kept off-balance sheet. Hence, this gambling with derivatives allows companies to manufacture huge profits and give the directors a significant bonus, but later the losses would be discovered after the bonuses were paid. Consequently, the accounting standards responded with IAS 39.

I.9.2. The International Accounting Standard 39

This standard states that under IAS 39.9 all derivatives must appear on the balance sheet at fair value. However, this standard is inconsistent with other standards such as IAS2.28 which states that the treatment of the hedged asset remains unchanged. In IAS 39 the change in the derivative must appear on the balance sheet at market value but the change in the underlying must not be recorded, the change must generally go through the Profit and Loss account and the hedged asset is shown at cost on the balance sheet. Thus, this created a misleading phenomenon known as artificial volatility. Artificial volatility is one of the main weaknesses of IAS 39, by making entities looking more risky than they actually are. **(Butler, 2009, pp. 67-68)**

(Kolb & Overdhal, 2010, p. 305) conclude that the basis rule is that derivatives must be recognized as assets or liabilities and that they are recorded at their fair market value on the balance sheet. However, the problem is when the value of derivative changes according to:

- ✓ How a derivative is being used;
- ✓ Whether prerequisite conditions have been satisfied to allow for special hedge accounting.

In case derivatives are used for trading purposes the derivatives' gains or losses are recorded in current earnings, as they arise. Hence, they are carried at their fair value. Under FAS 133 there are three types of hedge treatments:

- ✓ Cash flow hedges;
- ✓ Fair value hedges;
- ✓ Hedges of net investments in foreign operations.

The main objective of the accounting treatment is to insure that the earnings impacts of the derivatives are recognized in earnings concurrently with those associated with the exposure being hedged. These hedges allow for the income statement to reflect the economic objective of using derivatives. Otherwise, the income statement would reflect a higher degree of earnings volatility. Thus, to eliminate the misleading of the artificial volatility the standard setters under IAS 39.86 state that a derivatives or financial instrument can qualify for hedge accounting treatment if it falls under one of these three headings: **(Butler, 2009, p. 69)**

- **Cash flow hedges**

A cash flow hedges is a hedge of an upcoming forecasted event. Thus, the exposure being hedged must involve the risk of an uncertain cash flow. Derivatives must be evaluated and it is necessary to determine how much of the result is effective and how much is ineffective. Hence, the effective portion is recorded in other comprehensive income (OCI) while the ineffective part is posted to current income (CI).

Moreover, in order to determine the amount that is appropriate to record into OCI, the assessment must be made on a cumulative basis. If the derivative results the cash flow effects of the hedged items the contributions of earnings are required. **(Kolb & Overdhal, 2010, pp. 306-307)**

Cash flow hedge is a hedge of the exposure to variability in cash flows that is attributable to a particular risk associated with a recognized asset or liability or highly probable forecast transaction and could affect profit or loss **(IAS39, 2011, p. 20)**

(Butler, 2009, p. 69) stipulates that entities do not want to hedge an underlying asset or liability but they want to hedge a future cash flow. Prior IAS 39 the entity record the change in the value of the derivative in the Profit and Loss account, however, under the IAS 39 the entity can reduce or eliminate the artificial volatility in the Profit and Loss account by putting any change in the fair value of the derivative into a temporary reserve account known as the Equity Reserve.

In paragraph 33 of FAS 133 "After qualifying for cash flow accounting the criteria for hedge accounting are no satisfying anymore, hence hedge accounting is no longer appropriate. Therefore, any accumulated OCI would remain these unless it is probable that the forecasted transaction will not occur by the end of the specified time period or within an additional two-month period of time thereafter".

Where in paragraph 32c "Reporting entities have complete discretion that allows for designating cash flow hedge relationship at will and later redesignating them, assuming all hedge criteria are again (or still) satisfied". Furthermore, as examples of exposures that qualify for cash flow hedge accounting:

- ✓ Interest rate exposures that relate to a variable or floating interest rates;
- ✓ Planned purchases or sales of assets;
- ✓ Planned issuances of debt or deposits;
- ✓ Planned purchases or sales of foreign currencies;
- ✓ Currency risk associated with prospective cash flows that are not denominated in the functional currency.

Thus, we conclude that the company is facing a potential transaction whereby the amount paid or received is uncertain, meaning that it faces risks. **(Kolb & Overdhal, 2010, pp. 306-307)**

In paragraphs 29g and 29h, the eligible risks are as follow:

- ✓ Currency risk associated with a forecasted transaction in a currency other than the functional currency, an unrecognized firm commitment and a recognized foreign currency-denominated debt instrument;
- ✓ The entire price risk associated with purchases or sales of nonfinancial goods;
- ✓ For interest-bearing instruments, a hedgeable exposure includes cash flow effects to changers in the full price of the instrument, changes the benchmark rate of interest, changes associated with the hedged item's credit spread relative to the interest rate benchmark, changes in cash flows associated with default or the obligors' creditworthiness and changes in currency exchange rate. **(Kolb & Overdhal, 2010, p. 307)**

Additionally, the final step in this hedge is to **prerequisite requirements** to qualify for cash flow accounting treatment as follow:

- ✓ In paragraph 28a hedges must be documented at the inception of the hedge, with the objective and strategy stated, along with an explicit description of the methodology used to assess hedge effectiveness.
- ✓ In the same paragraph, dates for the expected forecasted events and the nature of the exposure involved must be explicitly documented.
- ✓ In paragraph 28b, the hedge must be expected to be highly effective, both at the inception of the hedge and on an ongoing basis, where effectiveness measures must relate the gains or losses of the derivative to changes in the cash flows associated with the hedged item.
- ✓ In paragraph 29b, the forecasted transaction must be probable.
- ✓ In paragraph 29c, the forecasted transaction must be made with different counterparty than the reporting entity. **(Kolb & Overdhal, 2010, p. 308)**

However, there are situations where the cash flow accounting treatment is not applied:

- ✓ Generally, written options may not serve as hedging instruments, except where the hedged item is a long option (Paragraph 28c).
- ✓ In paragraph 28d, basis swaps do not qualify for cash flow accounting treatment unless both of the variables of the swap are linked to two distinct variables associated with two distinct cash flow exposures.
- ✓ Cross-currency interest rate swaps are not qualify for cash flow hedge accounting treatment if the combined position results in exposure to a variable rate of interest in the functional currency, this hedge would qualify as a fair value hedge.

- ✓ In paragraph 29e, with held-to-maturity fixed income securities under statement 115, interest rate risk may not be designated as the risk exposure in a cash flow relationship.
- ✓ In paragraph 29f, the forecasted transaction may not involve a business combination subject to opinion 16 and does not involve a parent's interest in consolidated subsidiaries, a minority interest in a consolidated subsidiary, an equity-method investment or an entity's own equity instruments.
- ✓ In paragraph 29h, prepayment risk may not be designated as the hedged item.
- ✓ In the same paragraph, the interest rate risk to be hedged in a cash flow hedge may not be identified as a benchmark interest rate, if a different variable interest rate is the specified exposure, if the exposure is the risk of a higher prime rate LIBOR may not be designated as the risk being hedged. **(Kolb & Overdhal, 2010, p. 308)**

- **Fair value hedges**

This type of hedge accounting is designed so that the entity can use derivatives to lock in the "fair value" of assets or liabilities on the balance sheet, where the entity is allowed to adjust the value of the underlying asset or liability by the change in the derivative, which allow to reduce the volatility in the Profit and Loss account **(Butler, 2009, p. 69)**

Fair value hedge is "a hedge of the exposure to changes in fair value of a recognized asset or liability or an unrecognized firm commitment, or an identified portion of such an asset, liability or firm commitment, that is attributable to a particular risk and could affect profit or loss". **(IAS39, 2011, p. 20)**

Fair value hedges requires specific criteria to be satisfied both at the inception of the hedge and on an ongoing basis. In paragraph 26, if after qualifying fair value accounting, the criteria for hedge accounting are no longer satisfied, hence hedge accounting is no longer appropriate. Thereby, gains and losses of the derivatives will continue to be recorded in earnings with no further adjustments to the original hedged item would be made. In addition, in paragraph 24 reporting entities have complete discretion to de-designated fair value hedge relationship at will and later redesignate them, assuming all hedge criteria remain.

As examples that qualify a fair value hedge accounting we mention:

- ✓ Interest exposures associated with value changes of fixed rate debt;
- ✓ Price exposures for fixed rate assets;
- ✓ Price exposures for firm commitments associated with prospective purchases or sales;
- ✓ Price exposures associated with the market value of inventory items;
- ✓ Price exposures on available-for-sale securities. **(Kolb & Overdhal, 2010, p. 309))**

Eligible risks in this accounting treatment are:

- ✓ The risk of the change in the overall fair value.
- ✓ The risk of changes in fair value due to changes in the benchmark interest rates.
- ✓ Currency risk associated with and unrecognized firm commitment, a recognized foreign currency denominated debt instrument and an available-for-sale security. **(Kolb & Overdhal, 2010, p. 310)**

Moreover, **prerequisite requirement** to qualify for fair value accounting treatment are:

- ✓ In paragraph 28a, hedges must be documented at the inception of the hedge, with the objective and strategy stated along with an explicit description of the methodology used to assess hedge effectiveness.
- ✓ In paragraph 20b, the hedge must be expected to be highly effective, both at the inception of the hedge and on an ongoing basis, where effectiveness measures must relate the gains or losses of the derivative to those changes in the fair value of the hedged item that are due to the risk being hedged.
- ✓ In paragraph 21a, if the hedged item is a portfolio of similar assets or liabilities, each component must share the risk exposure, and each item is expected to respond to the risk factor in comparable proportions.
- ✓ In paragraph 21a2 and 21f, portions of a portfolio may be hedged if they are a percentage of the portfolio, one or more selected cash flows, an embedded option and the residual value in a lessor’s net investment in a direct financing or sale-type lease.
- ✓ In paragraph 21b, a change in the fair value of the hedged item must present an exposure to the earnings of the reporting entity.
- ✓ When cross-currency interest rate swaps results in the entity being exposed to a variable rate of interest in the functional currency, fair value hedge accounting is permitted. **(Kolb & Overdhal, 2010, p. 310)**

However, there exist situations where fair value accounting treatment is not applied:

- ✓ In paragraph 20c, written options may not derive as hedging instruments, expect when the hedged item is a long option. In addition, FAS 133 defines any combinations that include a written option and involves the net receipt of premium either at he inception or over the life of the hedge as a written option position.
- ✓ Assets or liabilities that are remeasured with changes in value attributable to the hedged risk reported in earnings, nonfinancial assets or liabilities that are denominated in a currency other than the functional currency do not qualify for hedge accounting. Furthermore, the prohibition does not apply to foreign currency denominated debt instruments that require remeasurement of the carrying value at spot exchange rates (Paragraphs 21c, 29d and 36)
- ✓ In paragraph 21c, investment accounted for by the equity method do not qualify for hedge accounting.
- ✓ In the same paragraph, equity investments in consolidated subsidiaries are not eligible for hedge accounting.
- ✓ Also in the same paragraph, firm commitments to enter into business combinations or to acquire or dispose of subsidiary, a minority interest, or an equity method investee are not eligible for hedge accounting.
- ✓ A reporting entity’s own equity is not eligible for hedge accounting (Paragraph 21c).
- ✓ In paragraph 21d, for held-to-maturity debt securities the risk of a change in fair value due to interest rate changes is not eligible for hedge accounting. Fair value hedge accounting may be applied to a prepayment option that is embedded in a held-to-

maturity security, however, if the entire fair value of the option is designated as the exposure.

- ✓ In paragraph 21f, prepayment risk may not be designated as the risk being hedged for a financial asset.
- ✓ In paragraph 36, except for currency derivatives, derivatives between members of a consolidated group cannot be considered to be hedging instruments in the consolidated statement, unless offsetting contracts have been arranged with unrelated third parties on a one-time basis. **(Kolb & Overdhal, 2010, pp. 310-311)**

- **Hedges of net investments in foreign operations**

Some entities invest in foreign entities; thereby the value of the foreign investment is exposed to foreign exchange movements, leading entities to enter into a forward foreign exchange agreement in order to hedge this exposure. The change in the forward contract is recorded in the Equity Reserve account and not in the Profit and Loss account. **(Butler, 2009, p. 69)**

As defined in IAS 21 hedge of the foreign currency risk of a firm commitment may be accounted for as a fair value hedge or as a cash flow hedge. **(IAS39, 2011, p. 20)**

Moreover, Hedge accounting for currency exposure associated with net investments in foreign operations gives rise to translation gains or losses understatement of Financial Accounting Standards number 52.

Therefore, these gains and losses feeds into the company's capital under an account called "the Currency Translation Account CTA" without being reflected in income statement of the firm. Effective results of such hedges are recognized in CTA coincident with the recognition of the net investment gains or losses, where ineffective portions of hedge results are recognized in earnings (paragraph 42).

If the criteria for hedge accounting are no longer satisfied, the hedge accounting will be stopped, thereby gains or losses of the derivatives will be recorded in earnings. In addition, reporting entities have complete discretion to hedge relationships at will and later redesignate them, assuming all hedge criteria remain satisfied.

Prerequisite requirements to qualify for hedge accounting treatment are:

- ✓ In paragraph 20a, hedges must be documented at the inception of the hedge, with the objective and strategy stated, along with an explicit description of the methodology used to assess hedge effectiveness. Where this documentation must include the identification of the hedged item and the hedging instrument and the nature of the risk being hedged.
- ✓ In paragraph 20b, the hedge must be expected to be highly effective, both at the inception of the hedge and on an ongoing basis. Where effectiveness measures must relate the gains or losses of the derivative to those changes in the fair value of the hedged item that are due to the risk being hedged. **(Kolb & Overdhal, 2010, pp. 311-312)**

As conclusion, in accounting derivatives the procedures depend on how derivatives are used and not on the nature of the used instrument. Moreover, these procedures are complicated because of the unavailability of results in derivatives' gains or losses being reflected concurrently with the income effects of the associated hedged item. Additionally, reporting entities must specifically qualify for this treatment and the assessment of whether they are qualified must be made on an ongoing basis. Consequently, the accounting treatment may change over the life of the derivative. **(Kolb & Overdhal, 2010, p. 312)**
Furthermore, if derivatives do not qualify for hedge accounting or derivatives that the entity may decide to treat as undesignated they will be identified as undesignated or speculative.
Eventhough they could qualify for hedge accounting. Hence, these derivatives are recognized as assets or liabilities for trading and the gain or loss arising from their fair value fluctuation is recognized directly in profit or loss. **(Ramirez, 2015, p. 25)**

(Butler, 2009, p. 69) argues that the changes in the derivatives contract must be recorded in the Profit and Loss account since the derivative do not meet the requirement of the hedge accounting.

According to **(Ramirez, 2007, p. 8)** derivatives are recognized at fair value on the balance sheet. Thereby, fluctuations in the derivative's fair value can be recognized in different ways, depending on the type of hedging relationship.
Furthermore, under IAS 39.9 "fair value is the amount for which an asset could be exchanged, or a liability settled between knowledgeable, willing parties in an arm's length transaction". **(Tosen, 2006, p. 8)**

IFRS 13 definition "fair value is the price that would be received to sell as asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date". **(IFRS, 2012, p. 4)**. Hence, IFRS 13 carries three level fair value hierarchy disclosers from IFRS 7.

Level 1: financial instruments

If an entity holds a position in a single asset or liability and the asset or liability is traded in an active market for identical assets or liabilities that the entity can access the measurement date, the fair value of the asset or liability is measured as follow: **(Ramirez, 2015, pp. 74-75)**

$$asset\ or\ liability\ fair\ value = quantity * price$$

Level 2: financial instruments

Financial instruments are valued with valuation techniques where all significant imputs are based on observable market data. **(Ramirez, 2015, p. 76)**

$$derivative\ fair\ value = (mid - market\ credit\ risk - free\ fair\ value) - adjustments$$

$$derivatives\ fair\ value\ (asset) = (mid - market\ credit\ risk - free\ fair\ value) - mid - to - bid\ adjustments - CVA - FVA$$

$$derivatives\ fair\ value\ (liability) = (mid - market\ credit\ risk - free\ fair\ value) + mid - to - offer\ adjustments - DVA + FVA$$

Level 3: financial instruments

Financial instrument are classified in this level if their valuation incorporates significant inputs that are not based on observable market data. **(Ramirez, 2015, p. 77)**

$$derivatives\ fair\ value\ (asset) = (mid - market\ credit\ risk - free\ fair\ value) - mid - to - bid\ adjustments - CVA - FVA - other\ adjustments$$

Where CVA is Credit Valuation Adjustment, DVA is Debit Valuation Adjustment and FVA is Funding Valuation Adjustment.

Credit valuation adjustment is when fair valuing the option, the entity was required to adjust the option's fair value to incorporate the risk that the counterparty to the option could default before its expiration. However, when fair valuing the option, the entity would be required to adjust the option's fair value to incorporate the risk that the entity will default before its expirations. Additionally, mega bank should have incorporated in the pricing the potential funding benefits stemming from future potential unfavorable movements in the derivative's fair value, this adjustment is FVA. **(Ramirez, 2015, p. 78)**

Section II. Risks, Performance and Financial Management

Fluctuations in the value of a security can be because of two reasons. The first reason is fluctuations in the entire market if the market rise as a whole after a cut in interest rates, all stocks will rise differently, and if it will move downward the stocks will decrease too. The second reason is due to factors specific to the company that do not affect the market for an example a major order, the bankruptcy of a competitor, a new regulation affecting the products of a company…etc. **(Vernimmen, 2005, p. 395)**

This section will begin with the types of risks and will present how to manage these risks followed by a presentation of the liquidity risk in banks in detailed way. Finally, we will describe the performance measurement methods and the financial risk management.

II.1. Types of Risks

(Schonharl, 2017, p. 2) defined risk as it is the possibility that an action causes losses for or damage to the actor.

II.1.1. Market risk

Market risk is defined as the uncertainty of a firm's value or cash flow that is associated with movements in an underlying source of risk such as movements in interest rates, foreign exchange rates stock prices or commodity prices. The effects of changes in the underlying source of risk are shown in movements in the value of spot and derivative positions. Another definition of Market risk is that this later refers to the sensitivity of an asset or portfolio to market price movements such as interest rates, inflation, equities, currency and property **(NAPF, 2013, p. 6)**.

II.1.2. Credit risk

(Bandyopadhyay, 2016, p. 1) defined credit risk as "the potential that a bank borrower or a group of borrowers will fail to meet its contractual obligations and the future loss associated with that". For banks, besides loans there are other sources of credit risk such as the banking book and trading book and both on and off balance sheet. Credit risk is the uncertainty and potential for loss due to a failure to pay on the part of counterparty. If the firm assumes that there is no credit risk which means that a lender cannot default it will borrows at a fixed rate. And if it borrows at a floating rate and swaps it into a synthetic fixed-rate loan, the firm faces the risk that the swap dealer will default leaving it owning the floating rate of LIBOR.

This risk is also called "counterparty risk" as pointed by **(Wilmott, 1998, p. 557)**. Where OTC options can have significant counterparty risk, therefore there has grown up over years a considerable body of rules and regulations governing Capital adequacy in order to ensure that banks are covered in the event of extreme market movements that might lead to collapse.

According to **(Chaplin, 2005, p. 39)** counterparty risk arises from interest rate swap trades and credit default swap trades and other deals.

Moreover, counterparty risk is associated with pre-settlement risk which is the risk of default of the counterparty during the settlement process prior to the final settlement which is the expiration of the contract **(Gregory, 2014, pp. 106-107)**.

Moreover, **(Hull, 2015, p. 544)** argue that credit risk arises from the possibility that borrowers and counterparties in derivatives transactions may default. Rating agencies such as Moody's, Fitch… provide ratings in order to describe the credit worthiness. With this rating the possibility of defaulting is reduced.

II.1.3. Interest rate risk

The holder of financial securities is exposed to the risk of interest rate fluctuations even if the issuer fulfills his commitments entirely there is still the risk of a capital loss or at least an opportunity loss. The sources of interest rate risk can be due to:

- ✓ Time difference in the repricing of bank assets, liabilities and off-balance-sheet instruments.
- ✓ The imperfect correlation in the adjustment of the rates earned and paid on different instruments with otherwise similar repricing characteristics.
- ✓ The presence of options in many bank asset, liabilities and off-balance sheet portfolios **(Beets, 2004, p. 60)**.

II.1.4. operational risk

According to **(Hilpisch, 2015, p. 15)** operation risk means that valuation and risk management processes as well as risks are related to IT systems used. Moreover, operational risk is the risk of a breakdown in the operations of the derivatives program. Such as power failure, computer problems, failure of staff personal to monitor and record transaction properly, the failure to have proper documentation and fraud perpetrated by traders or staff personnel. For an example, derivatives trade must be done by persons higher in the organization and not allowed to anyone otherwise it will be derivatives losses. Because of the complexity of operational risk since it is difficult to identify and even to define it, derivative that protect against this risk do not exist, but there is a discussion to create operational risk derivatives in the future **(Chance & Brooks, 2010, pp. 555-556)**.

II.1.5. Model risk

Model risk is the risk of using an inappropriate model or model which contains error or using wrong inputs, in pricing financial instruments like derivatives. And to best insurance against this risk is knowledge, the knowledge of the theories and models **(Chance & Brooks, 2010, p. 556)**. Moreover, **(Hilpisch, 2015, p. 15)** defined model risk is as the risk that valuation and risk management rely on the specific model used is inappropriate.

II.1.6. Liquidity risk

Liquidity risk mainly argues that there is a mismatch between the size and maturity of assets and liabilities. Moreover, it is more likely that the maturity of loans tends to be longer than that for deposits **(Carey & Stulz, 2006, p. 69)**.

Liquidity risk is the risk that a firm will need to enter into derivatives and find that the market for that transaction is so thin that the price includes a significant discount or premium for that liquidity. Moreover, **(Durbin, 2011, p. 27)** defined liquidity risk as the probability that you lay not find a trading opportunity at a desirable price when you are ready to get out of a position. However, according to literature there is discussion about creating liquidity risk derivatives **(Chance & Brooks, 2010, p. 557)**.

II.1.7. Accounting risk

Accounting risk is the risk of the uncertainty over the proper accounting treatment of a derivative transaction. Users of derivatives are always afraid that the manner in which they account for derivatives will be declared inappropriate which will lead to restate certain transactions with the potential to lower past earnings **(Chance & Brooks, 2010, p. 557)**.

II.1.8. Legal risk

Legal risk is defined as the legal system will fail to enforce a contract. In order to control this risk it is important to have a good documentation of all transactions. In addition, the International Swaps and Derivatives Association (ISDA) has established standards of documentation for derivatives transactions such as contract templates, formal definitions of key terms, and specific provisions that are widely used in OTC derivatives transactions **(Chance & Brooks, 2010, p. 557)**.

II.1.9. Tax risk

Tax risk is the risk that taxes or the interpretation of tax laws will change unexpectedly. Certain hedging transactions would be taxed in a different manner and the threat that completed transactions will have to be re-taxed always looms **(Chance & Brooks, 2010, p. 557)**.

II.1.10. Regulatory risk

The definition of the regulatory risk is that it is the risk that regulations will change, because regulators are controlled by the political party. Which means that certain existing or contemplated transactions can become illegal or regulated **(Chance & Brooks, 2010, p. 558)**.

II.1.11. Settlement risk

This risk is common in international transactions. A financial transaction between a bank in country A and a corporation in country B on settlement day the bank wires its funds to the corporation under the assumption that when the market opens, the corporation will wire its funds to the bank. However, when the corporation's market opens, it announces that it is bankrupt and will suspend all payments. Thus, the bank will be out the money and will have to get in line with the corporation's other creditors **(Chance & Brooks, 2010, p. 558)**.

In addition, the market risk can be represented in the following types of risk according to **(Hilpisch, 2015, p. 14)**:

- ✓ **Price risk:** this risk relates to uncertain changes in the underlying's price such as index or stock price movements.
- ✓ **Volatility risk:** the term volatility refers to the fluctuation of the underlying's returns.
- ✓ **Jump or crach risk:** the previous stock market crashes such as 1987, 1998, 2001 and 2008 indicate that there is a significantly positive probability for large market drops.
- ✓ **Correlation risk:** the correlation measures the co-movement of two or more assets or quantities, it may change overtime and become close to 1.
- ✓ **Industrial, commercial and labour risks:** These risks are due to lack of competitiveness, emergence of new competitors, technological break, an adequate sales network…etc. These risks tend to decrease cash flow expectations, thereby affecting the value of the stock.
- ✓ **Solvency risk:** The debtor cannot repay the creditor it is also called counterparty risk.
- ✓ **Currency risk:** Fluctuations in exchange rate lead to a loss of value of assets denominated in foreign currencies ot these fluctuations can also lead to a raise in the value of debt denominated in foreign currencies when translated into the company's reporting currency base.
- ✓ **Political risk:** Particular political situation or decisions by the authorities can create risks such as nationalization without sufficient compensation revolution, exclusion from certain markets, discriminatory tax policies inability to repatriate capital…etc.
- ✓ **Inflation risk:** This risk is that the investors recover their investment with a depreciated currency.
- ✓ **The risk of fraud:** This risk is that some parties to an investment will lie or cheat by using asymmetries of information to gain unfair advantage over other investors.
- ✓ **Natural disaster risks:** This risk includes storms, earthquakes, volcanoes…etc. which destroys assets.
- ✓ **Economic risk:** This risk is characterized by bull or bear markets, anticipation of acceleration or a slowdown in business activity or changes in labor productivity. **(Vernimmen, 2005, pp. 387-388)**
- ✓ **Moral hazard risk:** the moral hazard risk arises when party having more information has incentive to behave inappropriately from the perspective of the party with less information. Hence, this risk happens due to the asymmetry information. **(Hossain & Chowdhury, 2015)**

II.2. Management of Risks

Financial institutions choose the level of risk that maximizes the objectives of firstly those who run them, then subject to constraints and penalties imposed by those who regulate them and lastly by capital markets.

II.2.1. Managing Market Risk

For an example in order to hedge options, we have at first delta which is the change in the option's price divided by the change in the underlying stock's price and at second if the delta changing too quickly we have option's gamma. Moreover, if the volatility of the underlying stock changes, it will lead to a change in the option price and this risk is captured by the option's vega. Hence, these delta, gamma and vega are risk measures used on option and even other instruments and they are used by managers in order to control market risk **(Chance & Brooks, 2010, pp. 524-525)**.

In addition, we have value at risk "Var" which is a dollar measure of the minimum less that would be expected over a period of time with a given probability. The basic idea of "Var" is to determine the probability distribution of the underlying source of risk and to isolate the worst given percentage of outcomes **(Chance & Brooks, 2010, p. 531)**.

II.2.2. Managing credit risk

It should be mentioned that in Over-The-Counter market, futures and exchange-listed options are insured against credit risk by the clearing house. Thus, these contracts are considered credit-risk free. However, in the bond market, credit risk is assessed by examining the credit ratings of issuers. This later is provided by agencies like Standard and Poor's, Moody's and Fitch's. They give terms to bank such as "triple A", "B double A"… etc. where more A's the better **(Chance & Brooks, 2010, pp. 541-542)**.

According to **(Eales & Choudhry, 2003, p. 101)** the reasons that an entity will default on a loan are:

- ✓ The inability to maintain the interest servicing;
- ✓ The bankruptcy;
- ✓ The insolvency leading to inability to repay the principal itself.

The magnitude of the risk is described by firm's credit rating where rating agencies considered in the analysis of the borrower:

- ✓ The financial position of the firm itself;
- ✓ Other firm-specific issues;
- ✓ An assessment of the firm's ability to meet scheduled interest and principal payments both in its domestic and foreign currencies;
- ✓ The outlook for the industry as a whole, and competition within it;
- ✓ General assessments for the domestic economy.

Another measure of credit risk is the credit risk premium, which is defined as the difference between yields on the same-currency government benchmark bonds and corporate bonds.

Credit risk derivatives swaps are used to insure a long corporate bond against credit risk. It also allows all parties involved to take bidirectional positions in pure credit risk. Hence, they can go long and short in credit risk without an initial funding requirement **(Wagner, 2008, p. 9)**.

Furthermore, credit derivatives were invented to capture credit risk and they were designed to separate market risk from credit risk. It is a derivative with a payoff determined by whether a third party makes a promised payment on a debt obligation. The first party is the credit derivative buyer, the second party is the credit derivative seller and the third party is the reference entity **(Chance & Brooks, 2010, pp. 548-549)**. Thus, these contracts were invented

to reduce or eliminate credit risk exposure by providing insurance against losses due to credit events **(Eales & Choudhry, 2003, p. 102)**.
Using credit derivatives has some advantages:

- ✓ They can be tailor-made to meet the specific requirements of the entity buying the risk protection;
- ✓ They can be sold short without risk of a liquidity or delivery squeeze;
- ✓ They can isolate credit risk from interest rate risk or from client relationships, and also using credit derivative allows to market to have more efficient model of pricing and structure of credit rates;
- ✓ Credit derivatives allow investors access to specific credits while allowing banks access to further distribution for bank loan credit risk **(Eales & Choudhry, 2003, p. 102)**.

(Eales & Choudhry, 2003, pp. 103-104) cited that credit derivatives are very important instruments to bond portfolio managers and commercial banks, this later wish to increase the liquidity of their portfolios, gain from the relative value arising from credit pricing anomalies and enhance portfolio returns.

[2] There exist two types of credit derivatives which are widely used:

- ✓ Credit default swap: This is an exchange of a periodic payment against a one-off contingent payment if some credit event occurs on a reference asset.
- ✓ First-to-default swap and basket default swap: in this type several assets are bundled together and credit swap is created on the whole basket. Therefore, the default event is defined in terms of default on any of the assets in the basket **(Bingham & Kiesel, 2004, pp. 399-400)**.

II.2.3. Managing Interest Rate

The value of equity derivatives is indirectly influenced by interest rates via risk-neutral discounting with the short rate **(Hilpisch, 2015, p. 14)**. In addition, the interest rate market has undergone significant changes after the beginning of a crisis **(Kienitz, 2014, p. 2)**. In the early of 1980's, banks managed their exposure to interest rate risk by balancing the assets in their investment portfolio until they felt they had enough fixed rate investments to offset their fixed rate liabilities. By the mid of 1980's, they shifted to derivatives instruments in order to hedge from interest rate risk with the volatility of interest rates. Hence, derivative instruments became useful to depository institutions because they give firms the opportunity to hedge their exposure to interest rate risk and complementing their lending activities. **(Brewer, Jackson, & Moser, 2001, pp. 51-52)**

- **Managing interest rate risk using traditional ways**
  - ✓ Gap analysis: this method is to compute maturity gap between assets and liabilities which is based on the repricing interval of each component of the balance sheet.
  - ✓ Duration analysis: it is the account's weighted average time to repricing, where then weights are discounted componenets of cash flow. Hence, when the duration of

bank's assets weighted by rands of assets equal to the duration of bank's liabilities weighted by rands of liabilities bank will be perfectly hedged.

- ✓ Simulation analysis: it involves the modeling of changes in the bank's profitability and value under alternative interest rate scenarios. This method of analysis permits an easy examination of a bank's interest rate sensitivities and strategies.
- ✓ Scenario analysis: this method consist many scenarios and defined the losses and gains of bank under each scenario, then to choose interest rate scenarios within which to explore portfolio effects. This method can be applied to many kinds of risk. **(Beets, 2004, pp. 61-62)**.

- **Managing interest rate risk using recent ways**

Pointed by **(Beets, 2004, p. 62)** commercial banks have become market makers as intermediaries in interest rate risk management products such as futures, forward rate agreements, interest rate swaps and options. Hence, banks will intermediate between long and short positions additionally clearing house assume the hedging of residual exposure which are resulting from an imbalance between the opposing sides in the transaction. The following strategies are considered as recent strategies to manage interest rate risk:

- ✓ Cash flow hedge: in this hedge, a variable rate loan can be converted to a fixed rate loan or it can hedge the cash flows from returns on securities to be purchased in future, and a cash flow from the future sale of securities and a cash flow of interest received on an existing loan.
- ✓ Market value hedge: this hedge is against exposure to changes in the value of a recognized asset or liability where a fixed rate can be converted to a variable rate.
- ✓ Foreign currency hedge: when using a forward to sell a foreign currency of the foreign operations would hedge the net investment. Therefore, if the exchange rate decreases, the net investment also decreases. However, the forward contract would increase in value because the currency could be purchased at a lesser amount than the locked in selling price. **(Beets, 2004, p. 63)**

II.2.4. Managing counterparty and systemic risk

(Gregory, 2014, pp. 20-24) argue that the OTC derivative market have developed mechanism in order to control counterparty and systemic risk. They create SPVs, DPCs, monolines and CDPCs.

- ✓ Special Purpose Vahicules (SPV): a Special Purpose Vahicules (SPV) or Special Purpose Entity (SPE) is legal entity company which is created to isolate a firm from financial risk. A company will transfer assets to the SPV for management or use the SPV in order to finance a large project without putting the entire firm or a counterparty risk. If a derivative counterparty is insolvent the client still receives their full investment using SPV. Hence, SPV transforms counterparty risk to legal risk.
- ✓ Derivatives Product Companies (DPC): Derivatives Product Companies (DPC) able OTC markets to mitigate counterparty risk, where these companies are generally triple A rated entities. The DPC provides external counterparties with a degree of protection

against counterparty risk by protecting against the failure of the DPC parent. The Triple A rating of a DPC depends on:

- Minimizing market risk;
- Support from a parent: the DPC is supported by a parent with the DPC being bankruptcy remote with respect to the parent to achieve a better rating. If the parent is in default it will be supported by a well-capitalized institution or be terminated.
- Credit risk management and operational guidelines: the management of counterparty risk is achieved by having daily mark-to-market and marging posting.

✓ Monolines and CDPCs: Monolines insurance companies were financial guarantee companies with strong credit rating that they utilized to provide credit wraps which are financial guarantees. While Credit Derivative Product Companies (CDPCs) were an extension of the DPC. Hence, in order to achieve good ratings monolines and CDPCs had capital requirements driven by the possible losses on the structures they provide protection on.

II.3 Banks and liquidity risk

According to **(Ruozi & Ferrari, 2013, pp. 3-5)** "the operation of a bank is closely dependent on the systematic acceptance of its liabilities by creditors and on the expectation that its commitments will always find a details confirmation". However, the insolvency of the bank maybe because of the technical reasons related to insufficient cash reserves such as poor management of liquidity risk in the short or medium long term. It also may be because of economic reasons related to the inadequacy of the equity value.

Because of the different maturity structure of assets which is mainly medium and long term and liabilities which are mostly short term, the risk that the bank is unable to respond to requests for payment by its customers. Therefore, the bank may be forced to sell a high volume of financial assets in its portfolio quickly and accepting the price below the current market value. Hence, the liquidity risk is the potential inability of a bank to meet punctually and in cost-effective way its envisaged contractual payment obligations when they fell due.

Furthermore, the aims of liquidity risk management are as follows:

✓ To ensure at all times an adequate corresponding balance between cash inflows and cash outflows, meaning the guarantee of the solvency of the bank;

✓ To coordinate the issuing by the bank of short, medium and long term financing instruments;

✓ To optimize the costs of refinancing, striking a trade-off balance between liquidity and profitability;

✓ To optimize for banks structured as banking groups, the intra-group management of cash flows, with the aim of reducing dependence on external financial requirements, by means of cash pooling techniques or other optimization instruments **(Ruozi & Ferrari, 2013, p. 7)**.

The processes of management and the methods for measuring liquidity risk vary according to the size of the bank, its prevalent type of assets, its level of internationalization and its relative organizational complexity. Hence, such processes attempt to measure and to monitor separately:

- ✓ The management of short term liquidity: the main aim of this management is to guarantee the ability to meet in the immediate future any repayment commitment which depends on the availability of adequate liquidity buffers such as cash and other highly liquid assets, and on refinancing facilities available to face temporary in balances between incoming and outgoing cash flows.
- ✓ The management of structural liquidity: the main aim of this management is to maintain an adequate balance between monetary inflows and outflows over different time in both medium and long term **(Ruozi & Ferrari, 2013, p. 11)**.

II.3.1. The origin of liquidity risk

Some element can accentuate the exposure of a bank to liquidity risk:

- ✓ Technical factors:
  - The complex timely cash flow structures with the development of financial instruments;
  - The wide contingent nature of instruments in funding or lending;
  - The development of payment systems.

This factors increase liquidity risk especially for larger banks because of their multi-currency transactional operations.

- ✓ Factors specific to the bank:
  - Reputation of the bank which can damage the bank's image and may destroy public trust;
  - Phenomena attached to the so-called commitments to provide funds and other undrawn off-balance sheet positions, which can generate extraordinary liquidity requirements.
- ✓ Factors of systemic nature: the presence of systemic factors can cause generalized funding problems for different banks and potential difficulties with financial asset disinvestment.

Hence, the occurrence of these elements generates a liquidity risk linked to internal bank factors such as corporate liquidity risk and risk linked to market factors or systemic factors outside the control of the bank such as systemic liquidity risk **(Ruozi & Ferrari, 2013, pp. 12-13)**.

II.3.2.Tools to assess liquidity risk

Basel Committee on Banking Supervision (BCBS) has identified a number of parameters in order to monitor liquidity conditions in banks. By using these parameters supervisory authorities capture early signals of a potential liquidity problem by observing a negative trend in one of the following metrics:

- ✓ Contractual maturity mismatch which identifies the gaps between contractual inflows and outflows of liquidity over set time bonds;
- ✓ Concentration of funding to detect those sources of wholesale funding (counterparties, instruments or currencies) that can trigger liquidity problems in the case of withdrawal;
- ✓ Outstanding balances of available unencumbered asset which can be used as collateral for secured borrowing or are eligible for central bank's standing facilities. Hence, supporting maturity mismatches and liquidity needs;
- ✓ Liquidity coverage ratios by significant currencies which is higher than 5% of the bank's total liabilities, unveiling mismatches between high-quality liquid assets and total net cash flows in each relevant currency;
- ✓ Market-related metrics that use market information in order to capture early warning signals of potential liquidity difficulties.

Moreover, proper liquidity management policy requires examining the liquidity risk as:

- ✓ A function of the impact area;
- ✓ The time horizon of the analysis;
- ✓ The origin and economic scenarios where the risk occurs **(Ruozi & Ferrari, 2013, p. 41)**.

II.3.3. Models and measurement techniques of liquidity risk

✓ **The funding liquidity risk**

The most widespread models for measuring funding liquidity risk are found in the following categories:

- Stock-based approaches: these approaches measure the volume of financial assets which can be liquidated quickly or can be used in refinancing facilities. There is two major indicators which can quantify the liquidity risk:

$$\begin{aligned} &cash\ capital\ position \\ &\quad = unencumbered\ assets - short\ term\ interbank\ funding \\ &\quad\quad - noncore\ deposits - undrawn\ commitments \end{aligned}$$

$$\begin{aligned} &The\ medium - long\ term\ funding\ ratios \\ &\quad = \frac{sum\ of\ available\ funding\ maturing\ above\ \text{"n"}years}{sum\ of\ assets\ maturing\ above\ \text{n}years} \end{aligned}$$

These indicators provide a representation of a static type of liquidity risk.

- Cash flow matching approaches: the application of these approaches presupposes that the different future cash flows are subdivided, by means of a series of maturity ladders. In order to establish the balance between the cash inflows and outflows in differently referenced time frames. Using these approaches each bank can measure the balance between expected cash inflows and expected cash outflows, modeling off-balance sheet cash flows.

- Hybrid approaches: these approaches presupposes simulated evolution of the balance between cash inflows and outflows in successive time frames, where:
  - At first level: liquidity management based on hybrid models presupposes a simulated evolution of the balance between cash inflows and outflows in successive time frames.
  - At second level: in order to monitor the short term liquidity position it is necessary to measure the financial assets that can be promptly liquidated or committed in refinancing operations.
  - At third level: it is necessary to define the operating limits based on the definitions of the maximum tolerable liquidity deficit regarding the different operational currencies and within each unit of the banking group. **(Ruozi & Ferrari, 2013, pp. 16-18)**.

Furthermore, it is important to consider the liquidity of the market where the financial product is negotiable. Generally, the liquidity of any financial instrument market depends on a multiplicity of factors:

- The rapidity with which a negotiation proposal can be executed;
- The implicit cost of the transaction in terms of the bid-ask spread;
- The ability to absorb possible imbalances between bid and offer-price without creating sensitive price variations. **(Ruozi & Ferrari, 2013, p. 20)**

However, before the 2007 crisis, many international organizations analyzed the causes of liquidity risk but they failed to envisage procedures of this risk. The first international Basel accord on bank capital in 1988 did not mention the liquidity risk. In 1992 the Basel Committee on Banking Supervision (BCBS) pose the problem of ensuring minimum management standards for such a risk and to contain the most appropriate measurement and management principles. In 2000, they aligned the principles of liquidity risk management with developments taking place in the major international banks 'practices. Moreover, in 2006 BCBS, the International Organization of Securities Commissions (IOSCO) and the International Association of Insurance Supervisions (IAIS) published a report called "The management of liquidity risk in financial groups" where the problem of the management of liquidity risk was analyzed at the level of financial groups. In contract, Basel II has not contemplated liquidity risk within the minimum capital requirements which constitute "Pillar One" of the international accord. Therefore, it was envisaged within international capital adequacy assessment process known as "Pillar Two" which indicate that every bank should adopt adequate systems to measure, monitor and control liquidity risk **(Ruozi & Ferrari, 2013, pp. 26-27)**. Pillar Two is divided into two phases that integrate each other:

- The Internal Capital Adequacy Assessment Process (ICAAP): where banks must make an independent assessment of capital adequacy, present and future related to the risk assumed and to corporate strategy.

- The Supervisory Review and Evaluation Process (SREP): where the supervisor analyzes the process of internal control, assesses the consistency of the results and gives an overall judgment and adopts and corrective measures.

In Basel II it is required that the adequacy of capital to be valued in the light of both the liquidity profile of the bank and market liquidity where bank operates. Additionally, in "Pillar Three" Basel II envisaged that the bank has to describe corporate strategies, objectives and practices, managing technique and methods, signaling systems, hedging practices and risk mitigation for cash risk area. However, it did not request specific information in relation to liquidity risk and left the national supervisory authorities the task of deciding whether to force the bank to divulge to the markets information on this type of risk.

According to **(Chorafas, 2008, pp. 244-245)** Basel Committee and the International Organization of Securities Commissions (IOSCO) pose a guideline for credit risk management process in the mid-July 2005. Its rules supplement certain aspects of Basel II and the market risk amendment, by addressing five issues:

- ✓ Treatment of counterparty risk for Over-The-Counter derivatives, purchase agreements and securities financing transactions;
- ✓ Handling double-default effects (wrong-way risk) for covered exposures, relating to trading book and banking book;
- ✓ Short-term maturity adjustments in the internal ratings-based (IRB) approach under Basel II, for some trading book-related items;
- ✓ Improvements to the current trading book regime, especially with respect to treatment of specific risks;
- ✓ Design of a specific capital treatment for unsettled and failed transactions.

Moreover, Basel III introduced new rules on capital, leverage, interaction between prudential rules and the economic cycle. Also the operation of banks in structured finance harmonized international minimum requirements based on a one-size-fits-all approach, without taking into account specificities of each bank's business model and the structural and functional characteristics of each banking system.

Hence, global liquidity standards and supervisory monitoring procedures have been developed by the new regulatory framework. In order to the bank raises its reliance to the liquidity stress that can be occur both in normal operating circumstances characterized by stable market situation and in stressed scenarios, with liquidity shortage at the bank level or at systemic level, the following categories need to be followed:

- Common principles for sound liquidity management and supervisions;
- Minimum standards of liquidity;
- Monitoring tools to assess liquidity risk **(Ruozi & Ferrari, 2013, pp. 27-28)**.

II.4. Measuring systemic risk

Systemic risk assessment can be divided into three categories:

- ✓ First category: in this category, the main objective is to focus on how balance sheet linkages can amplify the size of shocks and influence the direction of propagation across borders.
- ✓ Second category: this category takes advantage of abundant market data and uses the information embedded in credit spreads and equity prices to measure systemic risk premia and the correlation of shocks across markets.
- ✓ Third category: to understand how specific types of shocks may escalate into more sever systemic events.

These categories consider risks originating from the asset and liability side **(Cerutti, Claessens, & McGuire, April 2012, p. 3)**.

The Macro Financial Risk Assessment Framework (MFRAF) has been constructed to provide stronger analytical under-pinnings for the links among solvency risk, market liquidity risk and funding liquidity risk. It involves a three-step process:

- ✓ Solvency risk: banks are subjected to common adverse macro-economic shocks that provoke asset losses due to a decline in the credit quality of the banks 'loans. Since expected defaults rise as macro-economic conditions deteriorate.
- ✓ Funding liquidity risk: initial losses reduce bank capital as a consequence short-term lenders refrain from rolling over their claims, therefore it will generate an increase in funding liquidity risk.
- ✓ Banking sector risk: a defaulting bank is unable to fulfill its obligations in the interbank market, which will cause counterparty credit losses in the system and leading to the potential default of other bank **(Gauthier & Souissi, 2012, pp. 31-33)**.

According to **(Vernimmen, 2005, pp. 401-402)** market risk and specific risk are independent, thereby they can be measured separately and we can apply the Pythagorean theorem to overall risk of a single security as follow:

$$(overall\ risk)^2 = (Market\ risk)^2 + (Specific\ risk)^2$$

Systematic risk is expressed by its sensitivity ti market fluctuations following this formula:

$$r_{Jt} = \alpha_J + \beta_J r_{Mt} + \varepsilon_{Jt}$$

Where:
r_{Mt}: is periodic market returns
J: (r_{Jt}): is the periodic return of each security
β_J: a parameter specific to each investment J. It expresses the relationship between fluctuations in the value of J and the market.

Moreover, a security's total risk is reflected in the standard deviation of its return $\sigma(r_J)$. Thus, a security's market risk equal to: $\beta_J * \sigma(r_M)$ where $\sigma(r_M)$ is the standard deviation of the market return. If $\beta > 1$ the security magnifies market fluctuations and if $\beta < 1$ the security is less affected by the market fluctuations.

However, the specific risk of the security J is the dtandard deviation of the different residues ε_{Jt}expressed as $\sigma(\varepsilon_J)$. It represents the variation in the sock that are not tied to market variation. Thereby:

$$\sigma^2(\varepsilon_J) = \beta_J^2\sigma^2(r_M) + \sigma^2(\varepsilon_J)$$

II.5. Calculating Beta

β measures a security's sensitivity to market risk and it is calculated as follow:

$$\beta_J = \frac{Cov(r_{J,}r_M)}{v(r_M)}$$

Where:

$Cov(r_{J,}r_M)$: is the covariance between the return of security J and of the market.

$v(r_M)$: is the variance of the market return. **(Vernimmen, 2005, p. 402)**

The market β equals to 1, because the β of fixed income securities range from about 0 to 0.5. The β of equities is higher than 0.5 usually and normally is between 0.5 and 1.5. However, few companies have a negative β and exceptionallywe found β greater than 2. **(Vernimmen, 2005, pp. 404-405)**

The following parameters explain Beta:

- ✓ Sensitivity to the sector to the state of the economy: the greater the effect of the state of the economy on business sector the higher is its Beta.
- ✓ Cost structure: the greater proportion of fixed costs to total costs, the higher the breakeven point and the more volatile the cash flows. Companies that have a high ratio of fixed costs have a high β and vice versa.
- ✓ Financial structure: the greater the company's debt the greater its financing costs which increase company's breakeven point and its earnings volatility. Thus, the raise in debt leads to an increase in leverage and therefore an increase in β of its shares.
- ✓ Visibility on company performance: the quality of company's management and the clarity and quantity of its information given to the market, β will be low and vice versa.
- ✓ Earnings growth: the higher forecasted rate of earnings growth, the higher the β.

II.6. Performance measurement

Performance measurement systems are used for the efficient and effective management of organizations **(Munir & Baird, 2019, p. 1)**

The term performance measurement has been used since the late 1970s, there are several definitions of this term including:

- The definition of Neely et al: "The process of quantifying the efficiency and effectiveness of past actions".
- The definition of Moullin: "The performance measurement evaluating how well organizations are managed and the value they deliver for customers and other stakeholders".

Hence, the measure of performance depends on the industry for an example financial performance uses financial indicators to represent the firm achievements. **(Bouheni, Ammi, & Levy, 2016, pp. 117-119)**

II.6.1. Classical methods

The classical methods depend on earnings to measure the financial performance of a firm. The main classical measures of performance are given in the following.

II.6.1.1. Ratio analysis

The financial ratios are calculated depending on information of a firm from its financial statements.

- ✓ **Leverage ratios:** leverage ratios show the extent to which debt is used in a company's capital structure. The debt-equity ratio is commonly used to assess the firm's leverage. **(Bouheni et al., 2016, pp. 120-121)**

$$Debt - equity\ ratio = \frac{total\ debt}{total\ equity}$$

$$Debt - to - capital\ ratio = \frac{total\ debt}{total\ equity + total\ debt}$$

- ✓ **Liquidity ratios:** these ratios give an image of a company's short-term financial situation or solvency.

$$Current\ ratio = \frac{current\ assets}{current\ liabilities}$$

$$Quick\ ratio = \frac{cash + short - term\ investment + A/R}{current\ liabilities}$$

$$Cash\ ratio = \frac{cash}{current\ liabilities}$$

- ✓ **Profitability ratios:** The income statement of a firm provides useful information on the profitability of firm's business.

$$Gross\ margin = \frac{gross\ profit}{sales}$$

$$Operating\ margin = \frac{operating\ profit}{sales}$$

Gross margin show the ability of a firm to sell its product for more than the cost of providing it. Operating margin reflects how much company earns before interests and taxes from each dollar sales.

$$Net\ profit\ margin = \frac{Net\ profit}{sales}$$

This above ratio reveals the fraction of each dollar in revenues that is available to equity holders after the firm pays interest and taxes. **(Bouheni et al., 2016, pp. 121-122)**

- ✓ **Operational ratios:** these ratios measures to show the efficiency of a company in its operations and use of assets. The following ratios are commonly used:
  - **Return on equity ROE:** it measures the banking management in all its dimensions. It also offers a picture over the way to use the capitals brought by shareholders and the effect of their retainer in bank's activity. The higher ROE means the firm is able to find investment opportunities.

$$ROE = \frac{Net\ income}{Book\ value\ of\ equity}$$

  - **Return on assets ROA:** it measures the effect of management capacity to use the financial and real resources of an institution in order to generate profit. This indicator is the most exact measure of banking activity due to the fact that it directly expresses the results.

$$ROA = \frac{Net\ income}{total\ assets}$$

Furthermore, the DuPont Identity is a tool used to express the ROE in terms of firm's profitability, asset efficiency and leverage. The DuPont analysis aims to explain the rate of return on common stockholders 'equity ROE in a detailed way by breaking it down into its component elements:

- rate of return on sales;
- assets turnover;
- Leverage.

$$ROE = \left(\frac{Net\ Income}{Sales}\right) * \left(\frac{Sales}{total\ assets}\right) * \left(\frac{total\ assets}{Book\ value\ of\ equity}\right)$$

$$ROE = Net\ profit\ margin * asset\ turnover * equity\ multiplier$$

$$ROE = ROA * Leverage$$

Developing ROE:

$$ROE = \frac{Ni}{E} = \left(\frac{Oi}{S}\right) * \left(\frac{S}{A}\right) * \left(\frac{Ni}{Oi}\right) * \left(\frac{L}{E}\right)$$

$$(operational\ margin) * (asset\ turnover) * (cost\ of\ debt) * (arm\ of\ leverage)$$

$$(economic\ profitability) * (debt\ structure)$$

Where:

Oi: Operational income.

E: Equities.

Ni: Net Income.

S: Sales.

A: Total assets.

L: Total liabilities.

- **Return On Invested Capital (ROIC):** this ratio is an indicator of the company's efficiency. It shows how much profit the company is able to generate giver the resources provided by its investors.

$$ROIC = \frac{EBIT\ (1 - Tax\ rate)}{Book\ values\ of\ equity + Net\ debt}$$

$EBIT$: Earnings Before Interest and Taxes. **(Bouheni et al., 2016, pp. 122-128)**

✓ **Solvency ratios:** these ratios give an image of company's ability to generate cash flows and pay its financial obligations.

- **Working capital ratio:** to evaluate the speed at which a company turns sales into cash, firms compute the number of accounts receivable days. **(Bouheni et al., 2016, pp. 128-129)**

$$Accounts\ receivable\ days = \frac{Accounts\ receivable}{Average\ daily\ sales}$$

To compare the firm's cost of sales.

$$Accounts\ payable\ days = \frac{Accounts\ payable}{Average\ daily\ cost\ of\ sales}$$

Turnover ratios are alternative method to measure working capital.

$$Inventory\ days = \frac{Inventory}{Average\ daily\ cost\ of\ sales}$$

✓ **Valuation ratios:** to measure the market value of the firm earnings per share (EPS).

$$EPS = \frac{Market\ capitalization}{Net\ income} = \frac{Share\ price}{earnings\ per\ share}$$

$$Market\ value\ of\ equity = shares\ outstanding * market\ price\ per\ share$$

Market value of equity depends on what investors expect those assets to produce in the future.

$$Market - to - book\ value = \frac{Market\ value\ of\ equity}{Book\ value\ of\ equity}$$

The variations in this ratio reflect differences in fundamental firm characteristics as well as the value added by management.

$$Entreprise\ value\ EV = Market\ value\ of\ equity + Net\ debt$$

The EV can be interpreted as the cost to take over the business. **(Bouheni et al., 2016, pp. 130-132)**

II.6.1.2. Income statements (P&L)

The Income statement list the firm's revenues and expenses over a period of time. It is also called the profit and loss statement. The last line of income statement shows the firm's net income. This later is equal to the profit that a firm has after subtracting costs and expenses from the total revenue. **(Bouheni et al., 2016, p. 133)**

II.6.1.3. Market value added

MVA is the difference between the current market value of firm and the capital contributed by investors. If MVA is positive the firm has added value, and if it is negative the firm has lost value.

$$MVA = Market\ value - Invested\ capital$$

II.6.1.4. Cash flow statement

Cash flow statement reflects how much cash comes in and goes out of a company over the quarter or the year. It is divided into three sections: operating activities, investment activities and financing activities. **(Bouheni et al., 2016, pp. 134-135)**

II.6.1.5. Variance analysis

This method explains the difference between actual costs and the standard costs allowed for the good output. It helps to understand the present costs and then to control future costs. In addition, it is also used to explain the variation in the actual sales and the budgeted sales.

II.6.1.3. Standard costing

Standard costing helps to control costs and business operations. This method aims to eliminate waste and increase efficiency in performance by setting up standards or formulating cost plans. **(Bouheni et al., 2016, p. 137)**

II.6.2. Modern Method

The measurement of performance can influence a firms" behavior and hence it affects the strategy of the firm. Consequently, the performance will be measured by the improvements and results achieved by the firm. The most commonly used modern measure of performance is Economic Value Added which is presented below.

II.6.2.1. Economic Value Added (EVA)

EVA is developed by Stern Stewart and company; it is a robust method and its immunity from creative accounting. After GAAP accounting correction, EVA is an estimate of true economic profit.

$$EVA = NOPAT - WACC * Capital\ employed$$

$NOPAT$: refers to net operating profits after taxes.

$WACC$: Weighted Average Cost of Capital.

$Capital\ employed$: Total assets subtracted with non-interest bearing liability in the beginning of the period.

The higher EVA leads to higher in the market value of the firm. The main objective of EVA is to determine which business units' best utilize their assets to generate returns and maximize shareholder value. Hence, it aims to determine the true profit of a company and it helps managers to set organizational goals on the basis of financial assessment and to keep the main motive of shareholders wealth maximization. It also gives the true economic profit and helps the managers in determining the bonuses, corporation, valuation and analyzing equities. **(Bouheni et al., 2016, pp. 139-141)**

II.7. Risk management

Risk management may lead a financial institution to hold more capital than required by its regulators because it maximizes the wealth of its shareholders by doing so. However, the ability to manage risks also enables financial institutions to take complex risks that will be hard to detect by regulators.

II.7.1. Traditional risk management techniques

II.7.1.1. Asset-liability management

Asset liability management is the proactive management of both sides of the balance sheet with a special emphasis on the management of interest rate and liquidity risks. The management of these risks has been already described in details previously. **(Bouheni et al., 2016, p. 173)**

II.7.1.2. Financial derivatives

As previously defined, financial derivatives are financial instruments that derive their value from more primitive assets. The most commonly used contracts to manage risk exposure are forwards, futures, options and swaps. **(Bouheni et al., 2016, p. 178)**

II.7.2. International risk management tools

- ✓ **Basel I**

In 1988, Basel Committee focused on the effective supervision of international banking operations through greater coordination among international bank supervisors and regulator. The main recommendation of this document is that banks should hold enough capital at least 8% of its weighted risk assets. Moreover, Basel I require all international banks to set aside capital based on the (Basel) risk assets ratio.

$$Basel\ capital\ ratio = \frac{Capital}{risk - weight\ assets}$$

$$= \frac{Capital\ (tier\ 1\ and\ 2)}{assets\ (weighted\ by\ credit\ type + credit\ risk\ equivalents)}$$

Banks were required to hold a backing for weighted assets of less than 8% total capital and at least 4% of tier 1 or core capital which is defined as issued and fully paid ordinary shares/common stock plus non-cumulative perpetual preferred stock and disclosure reserves, while supplementary capital (tier 2) is all other capital (undisclosed reserves, property where the value changes, bonds).

For asset weight:

- No risk (0% weight) being assigned to cash, gold and bonds issued by OECD governments.
- 20% weight characterizing claims on agencies of OECD governments and local public sector entities.
- 50% weight attributed to mortgage loans.
- 100% weight assigned to all claims on the private sector, non-OECD governments, real estate, investments and all other assets.

In 1993, the Basel Committee began to address the treatment of market risks and in 1996 an amendment was released including the types of market risk, equity risk, interest rate risk, debt securities and debt derivatives and equity derivatives will expose bank to market risk.

In the numerator of the Basel ratio a third type of capital tier 3 can be used by banks only when computing the capital charge related to market risk and subject to the approval of the national regulator. Tier 3 includes short-term subordinated debt with a maturity of less than 2 years. **(Bouheni et al., 2016, pp. 180-183)**

✓ **Basel II**

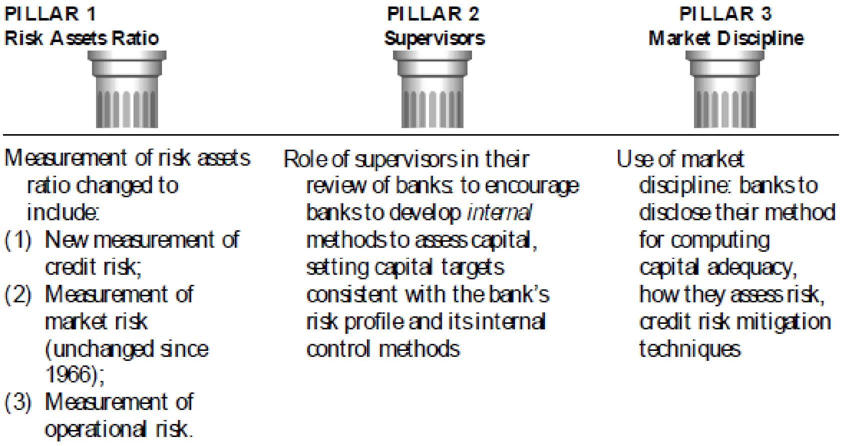
In June 2004 a Basel II was released after many issues with Basel I. “New capital regulation rules, known as Basel II will more closely align regulatory requirements with economic risk and will have a profound effect on banking industry structures and practices”. **(Bouheni et al., 2016, pp. 183-184)**

Furthermore, the three pillar of Basel II are as follow:

- Corporate strategy: “capital allocation should not be done on general income basis, it should follow strategic decisions, prognosticate business opportunities and promote chosen lines of activity using income from channels with less future cash flows”.
- Risk management: “the amount of current and future exposure is vital input to all strategic decisions and therefore to capital allocations”.
- Advanced information technology: ”top-tier information technology IT provides the infrastructure which would allow factual allocation of financial resources”. **(Chorafas, 2004, p. 4)**

Moreover, the proposal consists of three interactive and mutually reinforcing pillars as shown in the following figure:

Figure (1.5): The three interactive pillar of Basel II



Source: (Bouheni et al., 2016, p. 183)

In Basel II the definition of Tier 1 and 2 is retained, while changes in the assessment of credit risk were maid and an attempt to measure a capital requirement for operational risk. **(Bouheni et al., 2016, pp. 183-184)**

✓ **Basel III**

In 2012, the Bank of International Settlements decided to implement Basel III, a comprehensive set of reform measures developed by Basel Committee on Banking Supervision. These measures aim to:

- Improve the banking sector's ability to absorb shocks arising from financial and economic stress.
- Improve risk management and governance.
- Strengthen bank's transparency and disclosures.
- Banks are required to have a minimum amount of capital to be able to absorb losses and still operate as going concern.

However, the recent crisis the losses that banks suffered have exceeded minimum capital requirements. Consequently, the Basel Committee has undertaken an extensive revision of bank regulation resulting new measures. **(Bouheni et al., 2016, pp. 184-185)**

II.7.3. CAMELS

CAMELS' rating was adopted on November 13 1979 by the Federal Financial Institution Examination Council, and then in October 1987 it was adopted by the National Credit Union Administration. CAMELS' rating has proven to be an effective internal supervisory tool for evaluating the soundness of a financial firm. By reviewing different aspects of a bank based on variety of information sources such as financial statement, funding sources, macroeconomic data, budget and cash flow, this rating ensures a bank's healthy conditions. **(Dang, 2011, p. 17)**

Moreover, CAMEL is an acronym for five components of bank safety and soundness:

- ✓ Capital adequacy;
- ✓ Asset quality;
- ✓ Management quality;
- ✓ Earning ability;
- ✓ Liquidity.
- ✓ Sensitivity to market risk.

II.7.3.1. Capital adequacy

Capital adequacy is defined as the capital expected to maintain balance with the risks exposure of the financial institution such as credit risk, market risk and operational risk, in order to absorb the potential losses and protect the financial institution's debt holder. According to **(Dang, 2011, p. 17)** "meeting statutory minimum capital requirement is the key factor in deciding the capital adequacy, and maintaining an adequate level of capital is critical element". In addition, the capital adequacy is examined based upon the two most important measures Capital Adequacy Ratio (CAR) or Capital to Risk-weighted Assets ratio and the ratio of capital to assets.

The capital adequacy is estimated based upon the following key financial ratios:

Table (1.1): Capital adequacy ratios

Ratios	Formula	Criteria
CAR	$\frac{(Tier\ 1\ capital - goodwill) + Tier\ 2\ capital}{Risk - weighted\ assets}$	≥ 8%
Equity capital to total assets	$\frac{Total\ capital}{Total\ assets}$	≥ 4-6%

Source: (Dang, 2011, pp. 17-18)

This capital ratio is required to be a minimum of 8% following the Bank for International Settlement (BIS). However, it may vary in some countries depending on the local regulators.

Moreover, the CAMEL model is scored from 1 to 5. In the context of capital adequacy, if the rating equals to 1 it indicates a strong capital level relative to the financial institution's risk. While when it equals to 5 it indicates a critical deficient level of capital which means an immediate assistance from shareholders or external resources is required. **(Dang, 2011, pp. 17-18)**

II.7.3.2. Asset quality

The loan portfolio is considered as the most important asset category; hence the greatest risk that banks face is the risk of loan losses derived from the delinquent loans.
Loans include five categories: standard, special mention, substandard, doubtful and loss. Non-performing loans ratios (NPLs) are considered as the proxy of asset quality, thereby they are regarded as the three lowest categories which are past or not been paid for international norm of 90 days or eve, 180 days in some countries. Hence, the bank is regulated to back up the bad debts by providing adequate provisions to the loan loss reserve account.
Additionally, the asset quality requirements are as follow:

- ✓ Trends should be noted such as loan concentrations, intra-group lending and real-estate exposure. A bank that heavily exposes to lend in some specific business sectors, lack of diversification will make its portfolio of loans vulnerable. Therefore, a portfolio mix shared equally by a third of each of consumer, commercial and industrial loans was designed by the American International Assurance.
- ✓ Loan growth: Large increases in loan growth and in the type of lending are prudent standards being followed.
- ✓ Non-performing loans: amount, composition, causes for large increase or decrease, how NPLs are defined.
- ✓ Reserves: what levels of reserves in relation to total loans and non-performing loans?
- ✓ Real-estate exposure: what percentage of loans are real estate based and what type of real estate lending-commercial or residential.
- ✓ Intra-group exposure: what level of lending is to affiliated companies, what is the group's primary business; what is the level of ownership.

Moreover, the asset quality is estimated based on the following key financial ratios:

Table (1.2): Asset quality ratios

Ratios	Formula	Criteria
NPLs to total loans	$\frac{NPLs}{Total\ loans}$	≤ 1%
NPLs to total equity	$\frac{NPLs}{Total\ equity}$	≤1%
Allowance for loan loss ratio	$\frac{Allowance\ for\ loan\ loss}{Total\ loans}$	≥1.5%
Provision for loan loss ratio	$\frac{Provision\ for\ loan\ loss}{Total\ loans}$	≥100%

Source: (Dang, 2011, pp. 19-21)

Every component of the CAMEL rating is scored from 1 to 5. Thereby, if the rating is equal to 1 in the context of asset quality it means that there is a strong asset quality and minimal portfolio risks. In contrast, if it equals to 5 it reflects a critically deficient asset quality that presents an imminent threat to the institution's viability. **(Dang, 2011, pp. 19-21)**

II.7.3.3. Management quality

Management quality is the capacity of the board of directors and management to identify, measure and controls the risks of an institution's activities and to ensure the safe, sound and efficient operation in compliance with applicable laws and regulations. Thus, the management requirements are taken into AIA's CAMEL approach to Bank Analysis as below:

- ✓ Ownership: the bank is majority-owned by the government because the support of this later is the most important mitigating factor to potential financial problems, or by private corporation that have economic significance.
- ✓ Size: top local ranking in term of assets.

- ✓ Year of operations: long operation history since establishment.

The management is estimated based on the following financial ratios:

Table (1.3): Management quality ratios

Ratios	Formula	Criteria
Total asset growth rate	Average of historical asset growth rate	Nominal GNP growth
Loan growth rate	Average of historical loan growth rate	Nominal GNP growth
Earning growth rate	Average of historical earnings growth rate	≥10-15%

Source: (Dang, 2011, pp. 21-22)

If the rating of management is equal to 1 it means that the management and board of directors are fully effective. In contrast, if it equals to 5 it means that there is a deficient management. **(Dang, 2011, pp. 21-22)**

II.7.3.4. Earnings ability

Earning ability rating reflects both the quantity and trend in earning and the factors that may affect the sustainability of earnings. Hence, inadequate management can result losses in loans and in return require higher loan allowance or pose high level of market risks. When the financial institution has a consistent profit, it will build a public confidence in this institution, absorb loan losses and provides sufficient provisions. Thus, the financial institution will be financially balanced and provide rewards of shareholders and consequently this institution will be sustainable.
The earnings requirements are as follow:

- ✓ Majority of earnings is annuity in nature (low volatility).
- ✓ The growth trend of the past three years is consistent with or better than industry norm and there are multiple sources of income.

The estimation of profitability is based upon the following key financial ratios:

Table (1.4): Earnings ability ratios

Ratios	Formula	Criteria
Net interest income Margin (NIM)	$\frac{Net\ interest\ income}{Average\ earning\ assets}$	> 4.5%
Cost to income ratio	$\frac{Operating\ expenses\ (excludes\ provision\ loss)}{net\ interest\ income + non - interest\ income}$	≤70%
Return on asset (ROA)	$\frac{Net\ interest\ income}{Asset\ growth\ rate}$	≥1%
Return on equity (ROE)	$\frac{Net\ interest\ income}{Shareholder'sequity\ growth\ rate}$	≥15%

Source: (Dang, 2011, pp. 22-23)

If the earning ability rate is equal to 1 it means that the financial institution have a strong earnings that are sufficient to maintain adequate capital and loan allowance and it also support operations. In contrast, if it equals to 5 it means that the bank experience consistent losses and represent a distinct threat to the institution's solvency through the erosion of capital. **(Dang, 2011, pp. 22-23)**

II.7.3.5. Liquidity

Defined by **(Dang, 2011, pp. 24-25)** "Liquidity expresses the degree to which a bank is capable of fulfilling its respective obligations". It is known that banks make money by mobilizing short-term deposits at lower interest rate, and lending or investing these funds in long term at higher rates. Therefore, the management should be able to maintain a level of liquidity sufficient to meet its financial obligations in a timely manner, and to be capable of quickly liquidating assets with minimal loss.

The liquidity requirements are:

- ✓ Majority of the funding is coming from customer's deposits, and no concentration of funding sources.
- ✓ Is there a maturity or interest rate mismatch?
- ✓ Does the central bank impose reserve requirements?

The financial ratios to estimate the profitability are:

Table (1.5): Liquidity ratios

Ratios	Formula	Criteria
Customer deposits to total assets	$\frac{Total\ customer\ deposits}{Total\ assets}$	≥75%
Total loan to customer deposits (LTD)	$\frac{Total\ loans}{total\ customer\ deposits}$	≤80%

Source: (Dang, 2011, pp. 24-25)

If this rating is equal to 1 it means that the institution has a strong liquidity levels, well-developed funds and it has access to sufficient sources of funds to meet present and anticipated liquidity needs. Otherwise, if it equals 5 it signifies that critical liquidity deficiency and the institution demands immediate external assistance to meet liquidity needs. **(Dang, 2011, pp. 24-25)**

II.7.3.6. Sensitivity to market risk

According **(Sarker)** to the sensitivity to market risk is assessed by the degree to which changes in market prices, interest rates, exchange rates, commodity prices and equity prices adversely affect earnings and capital of banks. The sensitivity of market risk can be measured using the sensitivity of the bank's earnings or the economic value of its capital base or net equity value linked to adverse changes in the interest rates of the market. Basel Committee on Banking Supervision highlights the following aspects: firstly, sensitivity of the financial institution's net earnings or the capital's economic value sensitivity to changes in interest rates under various scenarios and stress environment. Secondly, volume, composition and volatility of any foreign exchange or other trading positions taken by the financial institutions. Thirdly, actual or potential volatility of earnings or capital because of any changes in market valuation of trading portfolios or financial instruments and lastly the ability of management in order to identify, measure, monitor and control interest rate risk as well as price and foreign exchange risk. **(Sarker, p.12)**

II.8. Financial Risk Management

According to **(Briys, Mai, Bellalah, & Varenne, 1998, pp. 9-13)** a strategic financial risk management should be at three levels:

- ✓ Strategic level: where risk is not considered as exogenous, but it is with the company business. The best hedge can be flexible production process which allows for different input-mixes.
- ✓ Economic level: moves in exchange rates, inflation, interest rates and commodity prices affect the company's cash flow directly and indirectly. Directly, through interest rate payments, raw materials purchase and indirectly through the impact of higher financing costs for customers on the demand for the company's products. It may also induce a relative price effect which affects differently the costs and the revenues which put the firm in a squeeze regarding its profitability.
- ✓ Finance level: at this level the company wants to transfer the residual financial risks from the balance sheet to the capital markets using forward contracts, futures contracts, swaps and options.
    - Forward rate contracts: these contracts are flexible and its terms are negotiated between the two parties. However, each party of this contract bears the risk that the other party defaults on the future commitments. Consequently, futures contracts are more preferred than forwards contracts.
    - Futures contracts: futures are used to lock in the company interest rate, exchange rate or commodity price like a forwards contracts but in an organized markets where the risk of default is completely eliminated due to the existence of clearing house where the position of the buyer is adopted to every seller, and the position of the seller is also adopted to every buyer. This means that each trader has obligation to the clearing house and this late will maintain its side of the bargain as well.
    - Swaps: this type of contract allows exchanging one type of debt for another one like a fixed rate debt against a floating rate debt. They are traded in the OTC markets and subject to default risk.
    - Options: options contract are more flexible than forwards and futures because they provide the buyer the protection and a full benefits associated with a favorable development of the commodity price in change with an option premium.
    - Hybrids: hybrids are special options whereby the upfront premium of the protective option is reduced by giving up part of the benefits derived from a favorable movement in the market.

- Indexed bonds: this kind of contract is used when the operating profits of a corporation are exposed to the fluctuations of an index where the exposure risk can be hedge partially by issuing bonds whose interest payments and/or principal repayment are linked to the index.
- Warrants and convertibles: this type of contract is considered the only affordable financing instruments when a company has a low credit rating and must implement a large investment program to survive.

Moreover, **(Durbin, 2011, p. 71)** defined financial risk management as the action to do to reduce the probability or degree of financial loss in the face of uncertainty. Hence, derivatives were invented for this purpose as hedging tools. Hedging involves recognizing and measuring the financial risk of an existing position so we can take some new position with opposite exposure characteristics and the gains and losses of the positions cancel each other.

Thus, derivatives are considered a natural financial risk management tool for the following reasons, firstly, derivatives value's is determined by the value of its underlier, hence, offsetting positions in a derivative and its underlie neutralize changes in the underlier's value. Secondly, derivative employs the power of leverage, which allows you to replicate a payoff partner of something you want to hedge at a lower cost than simply trading more of the thing itself.

II.8.1. Risk management with futures contracts

Hedging is defined as a transaction on a futures exchange undertaken to reduce a preexisting risk inherent in an underlying business activity **(Kolb & Overdhal, 2003, pp. 70-71)**. Using futures contracts for hedging purposes lead us to different kinds or types of hedge, which are as follow:

- ✓ Short hedge: when a firm knows it will sell an asset in the future, it can hedge the price of this asset using futures by taking a short position.
- ✓ Long hedge: when a firm knows it will buy an asset in the future, it can hedge the price by taking a long position in a future contract.
- ✓ Inventory hedge: traders distinguish between a futures position they establishes to hedge an existing position in the cash market.
- ✓ Anticipatory hedge: traders can also distinguish a futures position that hedges a cash position they expect to take in the future. As a remark, most of the hedging in the financial markets is anticipatory.
- ✓ Micro hedge: this kind of hedge describes a futures position that is matched against a specific asset or liability item on the balance sheet.
- ✓ Macro hedge: it describes a hedge that is structured to offset the net risk associated with the hedger's overall asset or liability mix.
- ✓ Strip hedge: futures position can be established in a series of futures contracts of successively longer expiration.
- ✓ Stack hedge: futures position can be stacked in the front month and then rolled forward into the next front month contract.

II.8.2. Risk management with options contracts

(Kolb & Overdhal, 2003, p. 142) argue that the option sensitivity measures both characterize an individual option and the risk exposure of a portfolio that includes options and other assets. Options offer exciting speculative opportunities which attract many traders, by offering a great deal of leverage which means that trading options can give investors more price actions for a given investment than simply holding the stock at the same time it can be riskier than holding stock. In contrast, if we combine options the risk can be low using the following strategies of combination, straddles, strangles, bull and bear spreads and butterfly spreads. **(Kolb & Overdhal, 2003, p. 155)**

II.8.3. Risk management with swaps contracts

In order to manage the interest rate risk, firms use interest rate swaps **(Kolb & Overdhal, 2003, p. 199)**

In the process of risk management, there exist three major steps, which are: **(Beaumont, 2004, p. 172)**

- ✓ Quantifying risk: interest rate risk is generally quantified items of duration and convexity, where the duration is the measure of a fixed income security's price sensitivity to a given change in yield where the larger a security's duration the more sensitive that security's price will be to a change in yield. For bonds, it is important for risk measurement to determine the duration and convexity, because these two latter are required to capture the full effect of a price change in most fixed income securities **(Beaumont, 2004, p. 181)**. For equities, the concept of duration is beta, which is defined as equity's price sensitivity to a change in the market index **(Beaumont, 2004, p. 182)**. In addition, for forwards and futures contracts, the duration of a forward is something less than the duration of its underlying spot. Leading to a reduction in market risk but at the same time there is the existence of credit risk. **(Beaumont, 2004, p. 190)**
- ✓ Allocating risk: firm's capital can be allocated to different business lines which involve the taking of various risks. Risk limits are expressed as ceilings-upper limits on how much capital may be committed to a particular venture. It also might exist for how much capital might be committed to a specified country for large companies while for smaller companies, ceilings might exist for how much capital might be allocated to different types of securities. **(Beaumont, 2004, p. 217)**
- ✓ Managing risk: the managing of risk consists of probability, time and cash flow **(Beaumont, 2004, p. 222)**.

II.9. Reasons to hedge

(Donald, 2013, p. 99) defined reasons that firms use derivatives as follow:

- ✓ To hedge;
- ✓ To speculate;
- ✓ To reduce transaction costs;

- ✓ To affect regulatory arbitrage.

But in practice, more than one of these considerations may be important. The choice of a hedging strategy can have a speculative component for an example: opinions about the future price of gold can affect the choice of hedging strategy.
In more details, the reasons of hedging can be described as follow **(Donald, 2013, pp. 102-103)**:

- ✓ Taxes: tax system permit a loss to be offset against a profit from a different year. In value of terms, the low will have a lower effective tax rate than the applied to profits. Thus, this motives traders to hedge. Additionally, tax rules that may entice firms to use derivatives include
    - The separate taxation of capital and ordinary income: where derivatives can be used to convert one forum of income to another.
    - Capital gains taxation: where derivatives can be used to defer taxation of capital gains income as with collars.
    - Differential taxation across countries: where derivatives can be used to shift income from one country to another.
- ✓ Bankruptcy and distress costs: a dollar of loss can cost the company who's facing bankruptcy more than dollar. Thereby, firms enter derivatives contracts that transfer income from profit states to loss states which lead to reduce the probability of bankruptcy or distress.
- ✓ Costly external financing: when a firm faces a loss, it will be obliged to pay for that loss by either using cash reserves or by borrowing or issuing new securities which are both external funds. If the firm choices to raise its funds externally it can be costly, because it will face both explicit and implicit costs. When borrowing a loan the interest rate on the loan will be higher because the lender may worry since the firm is in decline. So the choice of issuing equity is much better in this case. While, if the firm chooses cash reserve it will reduce a firm's need to raise funds externally. Hence, a dollar of low may actually cost the firm more than a dollar. Thus, hedging can safeguard cash reserves and reduce the probability of costly external financing.
- ✓ Increases debt capacity: firms prefer to use debt because it is a tax-advantaged way to raise funds. But at the same time, lenders will lend the firms according to its debt capacity. For that, firms must reduce the riskiness of its cash flow in order to raise its debt capacity and to be more valuable.
- ✓ Managerial risk aversion: risk averse persons are persons whom are unwilling to take a fair bet, and they are harmed by a dollar of loss more than they are helped by a dollar of gain. If managers of a firm are risk-averse, they will try to reduce the uncertainty but in fact managers take more risk in a firm because it is more valuable for them.
- ✓ Non-financial risk management: risk management is a series of decisions that start when the firm begins its business for an example beginning work in a foreign country, the firm will enter in costs of doing business abroad which means it will deal with tax codes and regulatory regimes. Also the choice between leasing or buying equipment or entering a new line of business…etc.

Furthermore, **(Hilpisch, 2015, pp. 16-17)** argue that the main purpose of hedging is to perfectly replicate the hedged derivative's payoff and consequently to eliminate all risk. But in practice, it is hard to realize due to these following reasons:

- ✓ The frequency of hedge rebalancing: theoretically, dynamic hedging requires continuous rebalancing but practically due to transaction costs and other market micro structure elements there is only discrete rebalancing which leads to hedge errors.
- ✓ Market incompleteness: hedgers eliminate all cash flow risk if markets are complete, but in case markets are not complete, hedgers can only minimize the expected hedge error. When risks cannot be hedge, the market become incomplete. So, we must minimize the risk and also an expected hedge error, or to super-replicate the derivative.

In addition, firms engage in hedging for the following reasons:

- ✓ To lower expected taxes.
- ✓ To lower financial distress costs: if firm losses money, it will appear in financial distress, thus, the customers may be less willing to purchase its goods. Therefore, it is necessary that firms use derivative in order to transfer income from profit states to loss states, confirming that hedging reduce the probability of bankruptcy or financial distress.
- ✓ To lower costly external finance: when a firm is in a loss state and chooses to borrow money, the lender fears for his money, hence, borrowing will be costly to the firms. Consequently, the firm use derivatives for hedging in order to safe its cash reserve and reduce the probability of raising funds externally.
- ✓ To increase debt capacity which is the amount a company can borrow.
- ✓ To manage risk aversion: managers of firm are not well diversified contrary to the investors. As a consequence, salary, bonus and compensation are tied to the performance of the firm. That is why a poor diversification makes managers risk-averse. Therefore, they have incentives to reduce uncertainty through hedging **(Finan, 2015, pp. 709-710)**.

In contrast, there exist reasons that a company do not choose to hedge. Because of the large companies which have financial accounting and legal departments and take advantage of the opportunities offered by derivatives markets, small companies are discouraged to use derivatives for the following reasons:

- ✓ Transaction costs of engaging in hedges such as commissions and the bid ask spread.
- ✓ The cost of expertise required to analyze a hedging strategy.
- ✓ The cost of monitoring and controlling the hedging transactions.
- ✓ Potential collateral requirements associated with some types of hedging.
- ✓ The tax and accounting consequences of hedges. **(Finan, 2015, p. 710)**

In **(NAPF, 2013, p. 3)** using financial derivatives help to manage risk exposures arising between assets and liabilities because a full immunization requires the future value of assets to equal the future value of liabilities at the time the payment is required.

To summarize, according to **(Chorafas, 2008, p. 75)** the objective of true hedging is the reduction of risk. Hence, hedging is a strategy of combining two positions in units of underlying assets where if the asset's price raises it will cost loss in short position but this loss can be compensated by the gains in the long position of the underlying asset. Thus, the financial manager should base the use of derivatives for hedging purposes on the firm's attitude to risk as well as the extent of its exposure.

II.9 Benefits of risk management

In the Modigliani-miller theory there are no taxes or transaction costs and information is costless and available to everyone. Thus, there is no need to practice risk management because shareholders can adjust their personal portfolios. When practicing risk management, firms benefit from it if their income fluctuates across numerous tax brackets. Risk management also reduces the probability of bankruptcy and allows firms to generate the necessary cash flow to carry out their investment projects **(Chance & Brooks, 2010, p. 523)**. Moreover, **(Finan, 2015, p. 703)** defines the process of risk management in three major steps:

- ✓ Identifying the source of risk;
- ✓ Choosing the ones to be hedged;
- ✓ Choosing the way of hedge.

Therefore, the uses of financial derivatives for hedging purposes can be from two perspectives as follow:

- ✓ Risk management from the producer's perspective: using financial derivatives a producer can protect his products from future fluctuation by taking a long position. This process can be achieved following this strategies:
    - Hedging with a forward contract: using a short forward contract, the producer can fix the future sale price at the current forward price.
    - Hedging with a put option: using a put option, the producer pays an option premium to create a floor in order to limit the losses if the price declines, and if the price raises he will get an unlimited profit.
    - Insuring by selling a call: a written call which means selling a cap set a maximum price for the producer therefore, if the price raises it will limit profit and if the price declines it will not limit the losses. Thus, the premium received by the producer helps reduce the losses.
    - Creating a collar: a collar sets maximum and minimum prices. By purchasing a put at one strike price and writing a call at a higher strike price, the producer may realize for its product. Although, the producer is exposed to the risk of variation between these two prices, he is not affected by the price variation above or below this range.

In combination with the producer's long position in the produced and the put and call options which constitute the collar a bull spread will be formed. **(Finan, 2015, pp. 703-704)**

- ✓ Risk management from a buyer's perspective: a buyer is in the opposite position of the producer. Hence, he can engage in any of the previous strategies used by the producer but he will do the opposite of what the producer does. Thus, the buyer's strategies are:
  - Enter into a long forward contract.
  - Sell a put option.
  - Buy a call option. **(Finan, 2015, pp. 706-707)**

Section III. Capital Structure, Cost of Capital and Cost of Equity Capital

Regarding literature, capital structure is a complicated concept at worldwide. Over years it becomes highly innovative and competitive especially since the issues of corporate governance which make the decisions making of capital structures whether to invests or reinvest or distributes more difficult.

In this section, we define the capital structure according to several theories then we evaluate the basic factors that affect capital structure. We close the section by providing a brief definition of cost of capital and its components including cost of equity capital in addition to their estimation methods.

III.1. Component of capital structure

There are two types in which a business can raise money debt, equity or the mixture of these two components. The distinction between debt and equity is often made in terms of bonds and stocks. Debt claim entitles the holder to a contracted set of cash flows while an equity claim entitles the holder to any residual cash flows left over after meeting all other promised claims. Moreover, debt has a prior claim on both cash flows on a period-to-period basis and on the assets of the firm. In addition, the tax laws have generally treated interest expenses which accrue to debt holders, very differently and often much more advantageously than dividends or other cash flows that accrue to equity.

Furthermore, debt is defined as any financing vehicle that is a contractual claim on the firm, creates tax-deductible payments, has a fixed life and has a priority claim on cash flows in both operating periods and in bankruptcy. Contrary to equity which is defined as any financing vehicle that is a residual claim on the firm, it does not create tax advantage from its payments, it also has an infinite life, does not have priority in bankruptcy and provide management control to the owner. However, any security that shares characteristics of both is a hybrid security. **(Damodaran, 2004, pp. 372-376)**

Moreover, Capital structure includes long-term debt, preferred stocks and common stocks **(Pratt & Niculita, 2002, p. 3)** where preferred equity is defined as the stocks with preference features such as seniority in receipt of dividends or liquidation proceeds and common equity represents stocks at the lowest or residual level of the capital structure **(Pratt & Grabowski, 2008, p. 4)**

- **Debt instruments**

✓ Secured debt: secured debt is "a loan extended to a borrower based on the ability of the borrower to repay the loan from the cash flows of its business operations.

✓ Unsecured debt: "it is made by a lender when the borrower is able to convince the lender that the general credit of the borrower is sufficient to insure repayment of the requested loan". **(Marks, Robbins, Fernandez, Funkhouser, & Williams, 2009, pp. 206-207)**

- **Equity instruments**

Common stock and preferred stock.

- ✓ Convertible preferred stock: this type of stock is an equity instrument that include voting rights based on the number of shares of common stock into which the preferred stock could be converted.
- ✓ Participating preferred: "the owner of these stocks take a priority over the common shareholders in terms of proceeds of a sale or liquidation additionally he will receive the face value of the preferred plus any accrued or cumulative but unpaid dividends, he also will receive a pro rata portion or any remaining assets or proceeds". **(Marks et al., 2009, p. 261)**

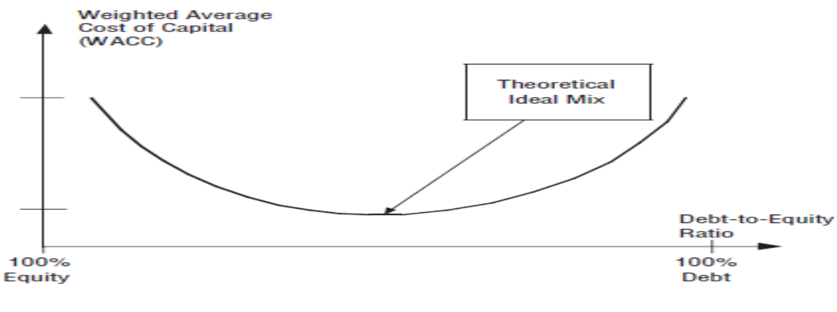
III.2. Capital structure definition

According to **(Baker & Martin, 2011, p. 94)** capital structure is the mix of financial securities both debt and equity issued by a firm to finance its assets. In order to determine an optimal capital structure, it is required to introduce features of the firm or capital markets that cause investor returns to depend on capital structure, such as taxes and bankruptcy costs **(Baker & Martin, 2011, p. 95)**. Moreover, **(Harding, Liang, & Ross, 2008, p. 1)** stipulate that firms choose their capital structure by balancing the benefits of debt such as taxes and agency benefits against its costs such as bankruptcy costs. Therefore, capital structure choices are determined by taxes and bankruptcy costs, agency costs and financial distress costs **(Titman & Tsyplakov, 2007, p. 2)**. **(Bierman, 2003, p. 71)** argue that the existence of financial distress costs tends to restrict the firm's will to issue large amount of debt.

Moreover, capital structure refers to the amount of debt and equity and their types used to fund the operations of the company. In Franco Modigliani and Merton Miller research in 1958 entitled "The cost of capital, corporate finance and the theory of investment" there is an optimal capital structure that balances the risk of bankruptcy with the tax savings of debt. Meaning that a company should use a combination of equity and debt together, this will lead to achieve greater returns to stockholders comparing to an all-equity firms returns. Thereby, using this strategy is accomplished by increasing the amount of debt and reducing the amount of equity and consequently the cost of capital will be lower. **(Marks, Robbins, Fernandez, & Funkhouser, 2005, pp. 22-23)**

The following figure shows the amount of cost of capital of two companies using different capital structure.

Figure (1.6): The cost of capital according to capital structure of a company



Source: (Marks et al., 2005, p. 23)

In the above figure; the cost of capital for of both a company capitalized entirely with equity or a company completely leveraged with debt is high. In between, there exists an ideal mix or the low point on the cost of capital curve. Hence, shareholders and managers must balance the risk of default in repaying debt with the availability of equity capital to pursue growth opportunities in order to determine the right capital structure for a company. In order to determine the right capital structure for a company in emerging countries, it is easier to obtain debt than equity which makes the capital structure decision more difficult.

III.3. An optimal capital structure

An optimal capital structure is the financing mix that maximizes the value of the firm following to the modern theory of capital structure started with MM theory in 1958. They show that in complete capital market the value of the firm is independent of its capital structure and managers cannot alter firm value or its cost of capital by the capital structure that they choose. In reality, the capital markets have some frictions such as taxes, costs of bankruptcy, asymmetric information, agency problems…etc. Consequently, a various theories has been developed such as the trade-off theory by Kraus and Litzenberger 1973, pecking order theory by Myers 1984, Myers and Majluf 1984, signaling by Ross 1977 and market-timing theory by Baker and Wengler 2002. **(Baker & Martin, 2011, p. 2)**

Moreover, an optimal capital structure is defined by a relation between debt and equity that minimizes cost of capital and thereby it will maximize the value of the firm **(Baker & Martin, 2011, p. 129)**. Therefore, a company needs to determine an optimum financing mix that minimized its cost of capital **(Watson & Head, 2007, p. 261)**.

When a firm faces financial difficulties and cannot meet its debt obligations, it usually organizes a meeting with its creditors to renegotiate the debt conditions. In order to avoid bankruptcy, if they agree reorganization will be declare otherwise bankruptcy must be declared. A bankruptcy could lead to a liquidation a firm's assets or it could allow the firm to restructure its debt and equity claims and continue to operate **(Miglo, 2016, p. 27)**.

In the first case, when a firm is forced to sold its asset, the payment order will be as follow secured creditors, unsecured senior debt holders, unsecured junior debt holders, preferred stockholders and common stockholders.

There are two types of bankruptcy costs:

- ✓ Direct costs: are fees paid to the lawyers, liquidators and agents involved in the sale of the assets;
- ✓ Indirect costs: are fees incurred while the firm is still in operation **(Miglo, 2016, p. 29)** including losses in customer confidence, declining vendor relationships, the loss of employees **(Baker & Martin, 2011, p. 18)**.

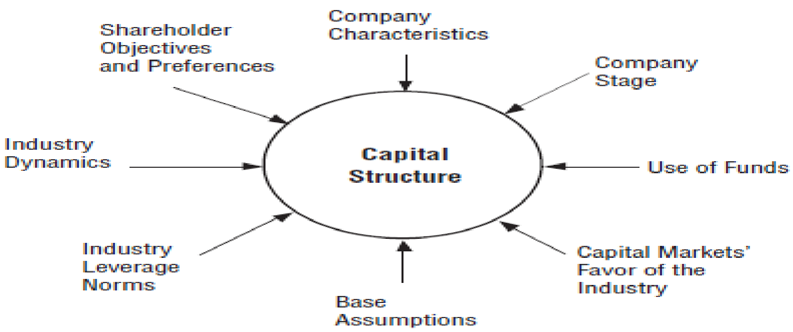
Hence, high bankruptcy costs make borrowing more expensive and thereby the levered firm's value is lower than unlevered firm's value. Moreover, in one imperfection bankruptcy costs, the optimal capital structure is 100% equity. However, in practice a firm prefers using deb in order to lower its taxes on income.

Generally, interest on debt lower the amount of taxes and firm earnings. Corporate taxes differ from a country to another leading some firms to re-domicile or to shield earnings within offshore subsidiaries within countries with lower tax rates. **(Miglo, 2016, pp. 30-31)**

III.3.1. Elements to considered in making the capital structure decision

The following figure represents the main factors that shape the capital structure of a company.

Figure (1.7): Factors that affect the capital structure of a company



Source: (Marks et al., 2005, p.26)

- ✓ **Achieve shareholder objectives**

The capital structure differs according to shareholders objectives. In public companies the objective is to increase the shareholder value while in private companies the objective is to maximize cash distributions to the shareholders or creation of employment, religious objectives…etc.

- ✓ **Seek least expensive capital**

Strong companies with experience management can have a better deals with minimum cost of capital structure contrary to weak companies hence their cost of capital will be higher.

- ✓ **Seek to optimize the return on invested capital**

Operating with overall levels of proper capital with the deploying of the selected mix of capital is important to optimize return on invested capital.

- ✓ **Shift to a proactive mode**

As pointed by **(Marks et al., 2005, p. 27)** a company must raise its capital when it can and not when it need it.

- ✓ **Match sources and uses of funds**

A company properly capitalized, it will match its assets and investments lives with the maturity of the used capital. Therefore, funding short-term cash needs with short-term lived liabilities.

- ✓ **Use of funds**

The use of funds is considered as a strong determinant in the capital structure of a company. It allows to determine the amount of capital required and the detailed list of assets and resources that will be acquired and when. **(Marks et al., 2005, p. 29)**

- ✓ **Company stage**

(Marks et al., 2005, p. 30) declare that a company stages are divided to four segments:

1. Start-up defined as 0$ to 1$ million in revenue;
2. Emerging growth defined as 1$ million to 10 million in revenue;
3. Lower middle-market defined as 10$ million to 50$ million in revenue;
4. Middle-market defined as 50$ million to 500$ million in revenue.

The following figure shows the types of financing vehicles by stage, where Y refers to yes and P refers to possible depending on company characteristics and industry.

Figure (1.8): Types of financing vehicles in a company by stages

	Company Stage <<< Earlier ---- Later >>>			
Type of Financing	Start-up $0 to $1.0M	Emerging Growth $1.0M to $10M	Lower Middle-Market $10 to $50M	Middle-Market $50M to $500M
Factoring	Y	Y	Y	Y
Receivables Financing	Y	Y	Y	Y
Inventory Financing	Y	Y	Y	Y
Real Estate Financing/Sale-Leaseback		P	Y	Y
Equipment Lease	Y	P		
Equipment Lease with Warrants	Y	Y	P	
Purchase Order Financing	P	Y	Y	Y
Microloan	Y			
Bridge Loan		Y	Y	Y
Lines of Credit	Y	Y	Y	Y
Revolver		P	Y	Y
Royalty Financing	P	Y	Y	Y
Industrial Revenue Bond		P	Y	Y
Debtor in Possession		P	Y	Y
Term Loan	P	Y	Y	Y
SBA Guaranteed Loan	Y	Y		
Junk Bond			P	Y
Commercial Paper				P/Y
Private Placement Senior Notes and Senior Unsecured Debt				Y
Senior Debt	Y	Y	Y	Y
Junior Debt			P	Y
Subordinated Debt		P	P	Y
Private Equity	Y	Y	Y	P
Public Equity				P/Y

Source: (Marks et al., 2005, p 25)

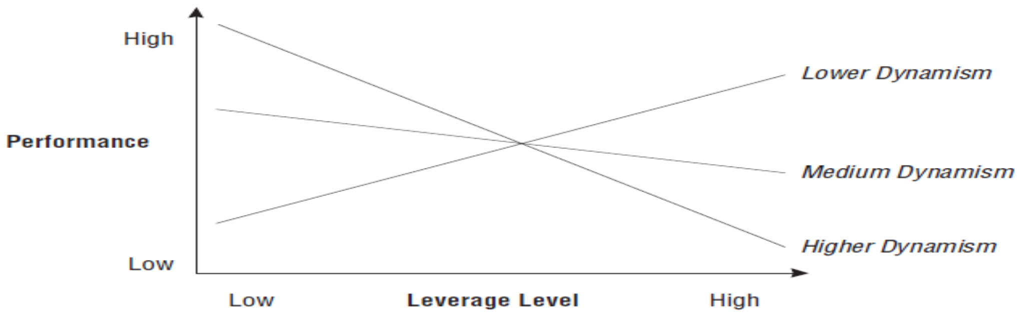
- ✓ **Company characteristics**

The quality of management is the most influential determinants in raising capital. Thereby, management strength will have the flexibility to choose its type and sources of capital. In addition, the ability to obtain a credit has an impact on capital structure. **(Marks et al., 2005, pp. 30-31)**

- ✓ **Industry dynamics**

The use of high levels of debt can create an adverse operating environment such as a change in the technology and its diffusion through an industry. According to previous studies, the lower levels of debt the more company success in industries characterized as exhibiting high levels of environmental dynamism. **(Marks et al., 2005, p. 32)**

Figure (1.9): Industry dynamics levels



Source: (Marks et al., 2005, p. 32)

As levels of environmental dynamism increase and viable alternative capital structure are not pursued, owners and managers experience reduced access to accurate business and financial forecasts needed to make critical decisions **(Marks et al., 2005, pp. 31-32)**.

- ✓ **Industry norms**

It is known that the classical measure of leverage is the debt-to-equity (D/E) ratio. It compares the total liabilities to the equity of a company when the D/E ratio exceeds 1.0 which means that outside funds provided by lenders exceed the capital provided by investors **(Marks et al., 2005, p. 33)**.

- ✓ **Industry trends**

Following **(Marks et al., 2005, p. 39)** when an industry is in favor the benefits of raising capital include greater ease in funding growth and better valuation. An outlook for overall industry performance influences the attractiveness of lending into or investing in companies and how debtor equity is structured. Additionally, to an outlook of the general economy and macroeconomic factors also are so important in evaluating industry trends.

- ✓ **Shareholders objectives and preferences**

The shareholders objectives and preferences influence the capital structure and shape it. If the holder of a share of a middle-market company views the business as a personal legacy, it will limit and define what types of new equity issuance can be appropriate and the deal term. Hence, it is not appropriate for personal preferences to sway the company capital structure decision. **(Marks et al., 2005, p. 39)**

Furthermore, **(Swanson, Srinidhi, & Seetharaman, 2003, p. 130)** argue that many factors can impact the capital structure decisions such as agency costs, personal tax, signaling effects, corporate governance, ownership structure, macroeconomic variables…etc.

III.4. Capital structure theories

There exist several theories that explain the capital structure. The main theories are summarized as follow.

III.4.1. Modigliani-Miller theory

With MM theory all changed, the propositions of MM informed that the value of firm was invariant to capita structure decisions **(Bierman, 2003, p. 1)**

The theory of Modigliani and miller is based on some assumptions which are also the assumptions of perfect market, and they are as follow:

- ✓ Perfect competition and minimal transaction costs;
- ✓ No asymmetric information among investors;
- ✓ No taxes;
- ✓ No bankruptcy costs;
- ✓ Contracts are easily enforced;
- ✓ No arbitrage opportunities.

Under these assumptions, Modigliani and Miller propose that the firm value is independent of the debt ratio, thus firms cannot increase their value by changing their capital structure **(Miglo, 2016, p. 23)**.

The concept of MM theory is that if the levered firm's shares are priced too high, investors will borrow on their own and they will use the borrowed money to buy shares in unlevered firms. This is called "Homemade leverage". In contrast, if the unlevered firms' shares are price too high, then investors will buy shares in levered firms and buy bonds. Hence, as conclusion capital structure does not matter only if there is a market imperfections which create friction in the process of either selling or buying securities **(Miglo, 2016, pp. 25-26)**. Moreover, Miller and Mongolian document that no optimal capital structure exist because weight average cost of capital remains unchanged at all levels of gearing. Because market value of a company depends on its expected performance and commercial risk meaning that the market value of a company and its cost of capital are independent of its capital structure under the assumption of perfection of capital markets. **(Watson & Head, 2007, p. 264)**

Furthermore, **(Baker & Martin, 2011, p. 70)** argued that in perfect markets, capital structure affects neither the risk nor the value of the firm. But in practice, markets have frictions. As results variables like financial leverage can have an impact on firm's risk both a negative and a positive effect. In the negative effect financial leverage can increase operating risk, impair the firm's access to capital and its ability to invest. In contrast, of the effect is positive financial leverage can reduce agency costs, increase managers bargaining power with non-financial stockholders. Hence, financial leverage can decrease sales growth, investments and market value of high levered firms. In addition, leverage can explain returns of a firm where some studies found a positive correlation between leverage and return and other studies found a negative relationship **(Baker & Martin, 2011, p. 89)**.

III.4.2. Trade-off theory

Interest on debt reduces the firm's taxes on income. However, debt also increases the probability of bankruptcy. Thereby, trade-off theory suggests that capital structure reflects a trade-off between the tax benefits of debt and the expected bankruptcy costs. The firms' value under this theory equals to the value of unlevered firm plus the benefits of the tax advantage of debt minus the expected bankruptcy costs as follow:

$$V = V_u + TS(D, I, T) - Bc(D, I, \beta)$$

Where:

V_u: is the value of unlevered firm.

TS: is the value of firm's tax shield, which depends on the level of debts D, the firm's earnings I and the corporate tax rate T.

Bc: is the expected value of bankruptcy costs and it depends on the level of debts D, the firm's earnings I and the parameter β which reflects the magnitude of bankruptcy costs **(Miglo, 2016, p. 32)**.

Kraus and Litzenberger (1973) proposed that firm can balance the tax benefits of debt against the deadweight costs of financial distress and bankruptcy firms choose debt over equity because they are allowed to deduct interest paid on debt from their tax liability. Thus, the gains from the choice of debt which is called tax shield increases firm value. Meanwhile, the higher a firm's debt ratio, the higher will be the probability of bankruptcy.

In addition, agency costs should be also added against the tax advantage of debt. Jensen and Meckling (1976) argue that managers objective is to maximize equity value instead of total firm value, by engaging in risky projects that benefit shareholders if it succeed but in case of failure the bondholder will lose. Thereby, bond investors demand a risk premium for this behavior. Moreover, the over investment and the under investment problem tend to be most pronounced for highly leveraged firms that suffers from financial distress. However, debt can have a moderating impact on agency conflicts. Managers are forced to generate constant cash flows to meet their firm's debt repayments, therefore to achieve optimal financing decisions managers of a firm need to evaluate the agency costs of debt like risk shifting and underinvestment against the agency costs of equity like free cash flow problem.

In the static trade-off theory, the firm's benefits and costs of debt are weighted against each other by adjusting to its optimal capital structure when benefit of debt is the tax shield and the cost is financial distress **(Baker & Martin, 2011, p. 366)**. In the extended trade-off theory the addition of asymmetric information costs and agency costs where the firm should adjust its capital structure where the marginal cost of debt equals marginal cost of equity. **(Baker & Martin, 2011, p. 129)**

This is the static trade-off theory which focuses only on a single-period decision which means that it has a solution for leverage, but there is no room for the firm ever to be anywhere but at this optimum. Because maintaining debt ratio and keeping it constant will be so costly to the firm. Hence, a natural extension is considered multiple periods in another word a dynamic trade-off theory. The first who argued that firms debt ratio is allowed to float in debt conidor are Kane, Marcus and McDonald 1984 and Brennan and Schwartz 1984. Thereby, if the debt ratio crosses upper or lower bound of this conidor, managers have to rebalance its capital structure back to the optimal level **(Baker & Martin, 2011, pp. 18-19)**.

III.4.3. The traditional approach of capital structure

Following to this approach an optimal capital structure does exist and thereby a company can increase its total value by the sensible use of debt in its capital structure under the following assumptions:

- ✓ No taxes exist, either at a personal or a corporate level;
- ✓ Companies have two choices of fiancé, perpetual debt finance or ordinary equity shares;
- ✓ Companies can change their capital structure without issue or redemption costs;
- ✓ Any increase in debt finance is accompanied by simultaneous decrease in equity finance of the same amount;
- ✓ Companies pay out all distributable earnings as dividends;
- ✓ The business risk associated with a company is constant over time;
- ✓ Companies' earnings and dividends do not grow over time. **(Watson & Head, 2007, pp. 262-263)**

III.4.4. Pecking order theory

This theory proposed by Myers and Majluf (1984) and Myers (1984) is based on the asymmetric information between firm insiders and outsiders. Managers will have more information about the true value of assets of the firm in addition to the future growth opportunities than the investors. If managers fell that the firm value is decreasing they will not issue more equity because if they do it will create a dilution of shares, thereby new shareholders will benefit at the expense of the old shareholders.

Hence, the right time to issue equity is when the firm is overvalued. By issuing equity the firm is sending a signal to the market that its equity is too expensive. Consequently, the optimal decision for a firm is to use internal funds whenever available because by doing that it will avoid asymmetric information problems. The firm can also use debt such as junior debt or convertible debt if its internal funds are depleted because it will be less affected by information asymmetry than equity.

To conclude, ranking the financing sources according to the degree they are affected by information asymmetry is the main concept of the pecking order theory **(Baker & Martin, 2011, pp. 19-20)**.

III.4.5. Market timing theory

Baker and Wurgler (2002) proposed that issuing equity when the stock market is perceived to be more favorable and market-to-book (M/B) ratios are relatively high have an impact on capital structure of the company. So, firms need to time their equity issue to stock market conditions and that the capital structure changes induce by the issued equity. In addition, Baker and Wurgler contend an ad hoc theory of the capital structure where the observed capital structure reflects the cumulative outcome of past attempts to time the equity market **(Baker & Martin, 2011, pp. 20-21)**.

III.5. Factors Affecting Capital Structure

According to **(Prasad, Green, & Murinde, 2001, p. 12)** market imperfections like taxes, financial distress asymmetric information and agency costs influence the capital structure of a company.

III.5.1. Tangibility of assets

The tangibility of assets is considered as a measure of the level of collateral a firm can offer to its debtors. It makes debt less risky but it also influence the capital structure of a firm. it can be measured using the ratio of net property, plant, and equipment to total assets, the ratio of research and development expenses to sales, the ratio of selling general and administration expenses to sales. Moreover, levered firms stock holders are prone to overinvest creating a conflict between shareholders and bondholders. And if debt is secured the creditors will have an improved guarantee or repayments. In context of agency costs managers of highly levered firms will be less able to consume excessive perquisites and bond holders will be monitoring these firms. Additionally, information asymmetry is low with tangible assets which will make equity issuances less costly. However, firms with less collateralizable assets have high monitoring costs **(Baker & Martin, 2011, p. 24)**.

III.5.2. Firm size

Firm size is measured by the logarithm of total assets or sales. Bankruptcy costs are higher for smaller firm because costs of bankruptcy consist a fixed part and variable part. In the trade-off theory, it is predictable that size and the probability of bankruptcy are negatively correlated, thereby a positive relationship between size and leverage. Moreover, large firms are more observed by analysts, therefore they should be more capable to issue informationally sensitive equity. While in pecking order theory, leverage and size have a negative relationship **(Baker & Martin, 2011, p. 24)**.

III.5.3. Growth opportunities

Growth opportunities can be measure using M/B ratio or the firm size measures or the ratio of capital expenditures to assets. Firms with large investment opportunities can maintain a low-size debt capacity to avoid financing future investment with new equity. In trade-off theory, firms with more opportunities of investment have less leverage while in the pecking order theory firms with more opportunities of investment exhibit less current leverage **(Baker & Martin, 2011, p. 25)**.

III.5.4. Profitability

Profitability is measured by return of assets (ROA). In the trade-off theory costs of bankruptcy reduce with the increase in profitability and in this theory it is predictable that costs of bankruptcy and agency increases leverage level in more profitable firms. Contrary to the pecking order theory which predicts that the higher earnings should results less leverage because the raise of capital will be based on the retained earnings debt and new equity issued. This prediction is in line with the signaling model where managers increase level of debt to signal an optimistic future for the firm **(Baker & Martin, 2011, p. 25)**.

III.5.5. Volatility

Trade-off theory and pecking order theory argued that there is a negative relationship between leverage and volatility of cash flows because the more volatility the higher both expected cost of financial distress and the debt related agency costs. This will decrease the probability of tax shield that will be utilized **(Baker & Martin, 2011, p. 26)**.

III.5.6. Industry classification

Harris and Raviv 1991 argue that firm industrial classification is an important determinant of leverage and report such as electronics and food has low leverage wile paper, airlines and steel have a high leverage. Moreover, regulated firms have more stable cash flows and lower expected costs of financial distress. In trade-off theory, agency problems in regulated firms and the need for debt are at lower levels. While in the pecking order theory industry classification affect the capital structure only if it serves as a proxy for a firm's financing deficit **(Baker & Martin, 2011, p. 26)**.

III.5.7. Tax considerations

In the trade-off theory when the tax rate is higher firms tend to issue more debt because firm will exploit the tax deductibility of interest payments to reduce their tax payments **(Baker & Martin, 2011, p. 27)**. However, Ross 1985 argue that if firms with other tax shields like net operating loss carry-forwards, depreciation expense…etc. if these firms issue excessive debt they will become "tax-exhausted". Meaning that they are unable to use their tax shields and debt will be crowded out.

III.5.8. Debt rating

Firm with credit rating have a lower degree of information asymmetry, these firms following to pecking order theory will use less debt and more equity even that they have an easy access to debt market because they have a rating.

III.5.9. Debt market conditions

With the increase in the expected inflation leverage will also increases due to the debt market timing according to trade-off theory because managers issue debt when inflation is expected to be high, and relative to current interest rates. Hence, firm issue more debt when interest rates are low **(Baker & Martin, 2011, p. 27)**.

III.5.10. Stock market conditions

Stock returns are determinant of capital structure changes. Managers will not issue equity after stock price run-ups according to the market timing theory. In the pecking order theory a negative relationship between stock prices and leverage leaning that firms tend to issue equity when price of stocks are high and when a high stock price coincides with low adverse selection. Moreover, if the asymmetry if information is low and the adverse selection costs is low, then the firm will also issue equity. Hence, firms tend to announce equity issue after releasing information **(Baker & Martin, 2011, p. 28)**.

III.5.11. Macroeconomic conditions

Gertler and Gilchrist 1993 argued that aggregate net debt issues of large firms increase subsequent to recessions induced by monetary contractions. If bankruptcy decreases, taxable income increases thereby debt will be less risky and leverage will be procyclical.

Moreover, Frank and Goyal 2009 document that agency conflicts are higher during recessions and therefore leverage should be counter-cyclical. While during the boom period, internal funds increases and thereby the debt level will decrease. Furthermore, in the pecking order theory there is a negative relationship between leverage and economic growth.

To summarize, when economic prospects are good, equity issues cluster, information asymmetry is low temporarily and leverage is counter-cyclical **(Baker & Martin, 2011, pp. 28-29)**.

III.6. Time Dimension of Capital Structure

According to **(Pedell, 2006, p. 185)** the target period of capital structure weighted at market values is relevant for the computation of weighted average cost of capital. Hence, future changes of the capital structure have to be documented by investment and financing plans for the purpose of rate regulation. Hence, capital structure does not change suddenly; the problem of assessing a future capital structure becomes relevant above all if rates are set form a long regulatory review period.

Moreover, **(Agarwal, 2013, p. 20)** declare that capital structure decisions have time dimensions defined by their strategic, operational or tactical goals. In order that firms achieve their goals, they raise funds based on their long and short term requirements. There is three dimensions that define the sources of capital for a firm:

- ✓ Cash flow: cash flows and outflows have to be estimated at the time of the acquisition of funds, the retention of funds and the redemption of funds.

- ✓ The time period: time period for cash flow and financial and non-financial obligations have to be estimated to meet the liquidity and solvency needs of a firm.
- ✓ The obligations associated with the source capital: the sources of funds must evaluate each source of funds because they have different obligation structures.

Firms have a choice between several sources: equity funds, loan funds, trade credit, government grants, off-balance sheet funds…etc. each source has its cost and obligations and its time and financial cost dimensions. These costs contribute to the total capital structure of a firm. Furthermore, **(Ziegler, 2004, p. 76)** point that interest rate implies a lower optimal nominal leverage, but it has no impact on the amount of outside financing.

For banks capital structure, shareholders would invest in bank if asset risk equal to zero. Generally, in positive asset risk, optimal capital increases with the bank's liquidation costs in the event of a run. In contrast, if no run is taken, optimal capital decrease the liquidation costs. Hence, the dependence of optimal bank capital on the deposit spread or a reduction in asset risk has two effects, the first effect is that it makes intermediation more profitable and the second effect is that it makes a run less probable, which will reduce the capital required at initial time **(Ziegler, 2004, p. 122)**. Banks optimizes their capital structure in the same ways as firms do except when their capital comes close to the regulatory minimum. **(Gropp & Heider, 2009, p. 29)**

III.7. Cost of Capital

In 1925, Hotelling was the first economist to have written down the formula for the rental price of capital service in the absence of variation in prices and taxations. In 1935, Keynes introduced the term "user cost of capital" in order to distinguish it from the price of the capital asset itself. Moreover, Haavelmo 1960 derived the following formula but this formula ignores the taxation effects:

$$\rho \frac{\partial Q}{\partial K} = q\ (r + \delta - \frac{q}{q})$$

Where:

Q: is the quantity if the output
K: is the quantity of the capital stock
$\frac{\partial Q}{\partial K}$: is the marginal product of capital service
ρ: is the price of output
q: is the price of investment good
r: is the after tax rate of interest
δ: is the rate of exponential depreciation

This formula has been modified to reflect the extent of tax-deductibility of depreciation by incorporating the tax policy for capital income as a determinant of the demand for capital services and hence investment. The next formula represents the after-tax cost of capital:

$$\rho \frac{\partial Q}{\partial K} = q\ (r + \delta) \frac{(1 - uz)}{(1 - u)}$$

Where:
u: is the rate of proportional taxation
z: is the present value of the depreciation deductions on one unit of new investment

In 1963 Jorgenson incorporate the effects of changes in the price of the capital good as well as the income taxation into the measurement of the cost of capital. He also recommended using the cost of capital as a factor price variable on a par with the wage rate in the integrated analysis of production and investment behavior. Thereby, the supply of output and the demands for labor and capital services in a competitive market economy can be expressed as functions of the price of output, the wage rate and the cost of capital. Additionally, Samuelson 1953's dynamic analogue of the "factor-price frontier" argued that the price of output can be expressed as functions of the wage rate and the cost of capital.

Furthermore, Jorgenson assumed that an exponential mortality density for capital in the aggregate and with constant rate of depreciation so does Hotelling 1925 and Haavelmo 1960.

In 1964 Arrow derived cost of capital formulas for capital characterized by other forms of mortality density. While in 1967 Hall and Jorgenson and hall in 1987 refined the after-tax cost of capital formula to reflect the effects of modifications of the income tax lows. **(L. J. Lau, 2000, pp. 4-5)**

III.7.1 Cost of capital definition

Cost of capital is the most fundamental and widely used concept in financial economies **(Rao & Stevens, 2007, p. 1)**. Cost of capital is an opportunity cost and it is one of the most important concepts in finance. It is also called discount rate, the expected return or the required return. According to **(Pratt & Grabowski, 2008, p. 6)** cost of capital is the percentage return that equates expected economic income with present value. Thereby, in this context the expected rate of return is the discount rate. This later is defined as the total expected rate of return used to convert anticipated future economic income into present value, and it represent the total expected rate of return that the investor requires on the invested amount **(Pratt & Grabowski, 2014, p. 12)**. Moreover, the opportunity cost of capital is equal to the return that could have been earned in alternative investments at a similar level of risk and liquidity **(Pratt & Grabowski, 2014, p. 3)**.

Another definition of cost of capital is that "cost of capital is the rate of return required by investors, which is a function of the risk on capital employed. Thereby, cost of capital depends on the risk of the assets-in-place, specifically its systematic risk since unsystematic risk are not remunerated". **(Vernimmen, 2009, p. 447)**

Firms calculate their cost of capital in order to determine a minimum discount rate, thereby, to use it in the evaluation of proposed capital expenditure projects. So, the firm can decide which project to undertake **(Porras, 2011, p. 6)**. Hence, the cost of capital is important for the following reasons:

- ✓ It is determining factor for economic growth, because it enlarges the pool of investors and the number of projects on economy can embark on.

- ✓ It conveys information such as competitiveness or capital structure which is transmitted within financial markets to establish market-clearing prices. **(Porras, 2011, p. 9)**

Moreover, Modigliani and Miller (1958, 1977) were the first to argue that the company's cost of capital is not a function of its capital structure. Cost of capital composed of both cost of equity and cost of debt is a function of:

- ✓ The risk of the assets;
- ✓ The cost of overall capital;
- ✓ The weight of each of them. **(Vernimmen, 2009, p. 448)**

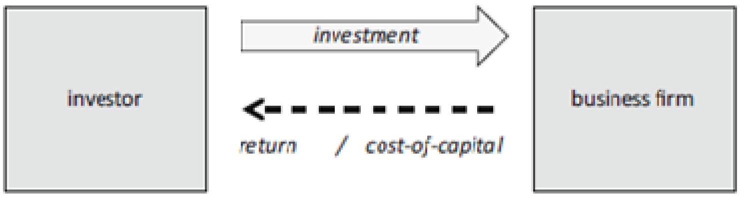
Hence, the cost of capital comes from the market place, so it is considered as a function of the investment and not the investor **(Pratt & Grabowski, 2008, p. 5)**.

Cost of capital can be defined according to three views:

- ✓ From the asset side: cost of capital is the rate that should be used to discount to a present value the future expected cash flows.
- ✓ From the liability side: cost of capital is the economic cost to the firm of attracting and retaining capital in competitive environment.
- ✓ From the investor side: cost of capital is the required return that an investor expects from an investment in firm's debt or equity. **(Pratt & Grabowski, 2008, p. 4)**

Furthermore, Cost of capital can be viewed by two perspectives:

Figure (1.10): Two perspectives on cost of capital



Source:(Pratt & Grabowski, 2008, p. 4)

Hence, cost of capital is the cost of using the funds of creditors and owners. And the weighted average cost of capital is the cost of raising additional capital with the weights representing the proportion of each source of financing that is used

III.7.2. Perspectives of cost of capital

- ✓ **The investor perspective**

(Schlegel, 2015, pp. 10-11) defined the cost of capital as the required return that investors are waiting for. In general, it is assumed that investors are risk-averse and that they required return depending on the risk of an investment. Hence, the higher the risk of an investment, the higher required return. It is known that risk is the variance of returns (Markowitz, 1952) meaning that the more returns fluctuate the more risky the investment is.

So, there is a possibility that the investors can receive no returns at all or a negative return or he can receive high returns.

Moreover, (Markowitz, 1952) argued that investor can eliminate the stock's variance by diversification, by investing in different stocks. However, there exist covariance among stocks so not all risk can be diversified; thereby following (Markowitz, 1952) it is better to invest in firms from different industries, because they have lower covariance.

- ✓ **The business firm perspective**

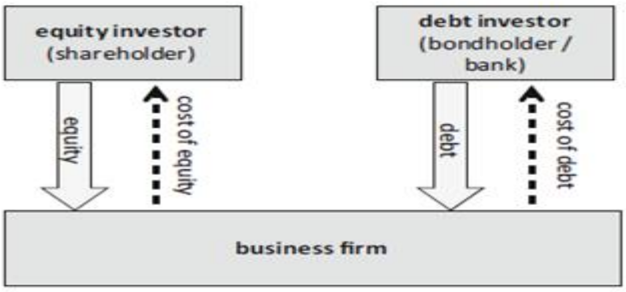
Cost of capital is defined as the rate of return that firm has to offer to compensate its investors both shareholders and bondholders, for the capital they provide. A firm can raise its capital from two main sources equity and debt. Equity is defined as "an ownership interest in an entity that permits a holder of the equity instruments to participate in the growth and success of the equity". And there are two primary categories of equity:

- ✓ Common stocks: common stocks are determined by reference to the corporate statues and case law of the jurisdiction in which the company is incorporated. The holder of this stock has the right to elect directors of the entity.
- ✓ Preferred stocks: preferred stocks are governed by the same statues of the common stocks but the holder has no right to vote.

While debt is an ability or obligation of a company that is evidenced by a note or written obligation of the company to repay the deal with interest in future time. **(Marks et al., 2005, pp. 161-163)**

Both of these two sources need to be remunerated at their own cost of capital as it is shown in the next figure.

Figure (1.11): Equity and debt investors



Source: (Schlegel, 2015, p. 12)

Hence, in order to calculate the cost of capital, in the financial theory it is referred to as the Weighted Average Cost of Capital (WACC) and it is calculated as follow:

$$WACC = W_{equity} * r_{equity} + W_{debt} * r_{debt}$$

Where:

W_{equity}: is the percentage weight of equity capital

r_{equity}: is the required return on equity/cost of equity

W_{debt}: is the percentage weight of debt capital

r_{debt}: is the required return on debt/cost of debt

However, Miller 2009 criticized the methodology WACC; its use is usually accepted and uncontroversial. Although, there are some difficulties in the individual components of the WACC which are:

- ✓ The component weights;
- ✓ The cost of debt;
- ✓ The cost of equity.

III.7.3. Component weights of cost of capital

Regarding financial theory, it is recommended that the component weights should reflect the target capital structure of the company. Target weights are superior because:

- ✓ Cost of capital should be forward looking;
- ✓ Actual weights are not stable and do not reflect target weights because the market value of equity is volatile.

Additionally, the book-value weights reflect a situation from the past and ignore current market conditions; consequently the use of this value is not adequate. **(Schlegel, 2015, p. 12)**

- **Cost of debt**

According to **(Schlegel, 2015, p. 13)** determining the cost of debt is easier than cost of equity for the following reasons. Firstly, there is a less debate over the correct methodology to estimate or calculate the cost of debt and secondly the interest on the company's debt is contractually agreed. Thus, the corporate treasurers have a good overview of the company's cost of debt.

Moreover, cost of debt is calculated for each company based upon:

- ✓ The S&P credit rating for the company;
- ✓ Otherwise, a long-term credit score from S&P global market intelligence credit analytics is substituted. **(Grabowski, Harrington, & Nunes, 2016, p. 73)**

- **Cost of equity**

This part of WACC is the most difficult to estimate, because there is an extensive debate about the correct methodology for its derivation. The cost of equity depends on the risk of the company's stocks. Financial theory suggested capital market models to calculate cost of equity and the most famous model for cost of equity capital estimation is the Capital Asset Pricing Model (CAPM). However, these models can only be applicable if the market data is available. Hence, with non-listed companies, the models are not applicable **(Schlegel, 2015, p. 13)**. But there exist proxy methods to be used for these companies such as the comparable company approaches developed by Brigham and Van Horne in 1977, analytical approaches 1970s and 1980s, practitioner approaches developed by Gup and Norwood 1982 **(Schlegel, 2015, p. 44)**.

III.7.4. Characteristics of cost of capital

- **Cost of capital is forward-looking**

Following **(Pratt & Grabowski, 2011, pp. 3-4)** the cost of capital is considered as investors' expectations, which include these elements:

- ✓ The risk-free rate: including:
  - Rental rate: rental rate is defined as the real return for lending the funds risk-free.
  - Inflation: the expected rate of inflation over the term of the risk-free investment.
  - Maturity risk or investment rate risk: the risk that the investment's principal market value will raise or fall during the period to maturity as a function of changes in the general level of interest rates.
- ✓ Risk: which is defined as the uncertainty as to when and how much cash flow or other economic income will be received.

The combination of rental rate and inflation is referred as the time value of money. Moreover, the cost of capital is applied to expected economic income, which is measured in terms of net cash flows, while present value is the dollar amount that a rational and well informed investor would pay today for the stream of expected economic income. Thus, mathematically the cost of capital is the percentage rate of return that equates the stream of expected economic income with its present cash value.

- **Cost of capital is based on market value**

The cost of capital is defined as the expected rate of return on a base value; this base value is measured as the market value of an asset. Thereby, the implied cost of equity for a company's stock is based on the market price per share at which it trades and not on the company's book value per share of stock. Using market data, the cost of capital can be estimated.

- **Cost of capital is usually stated in nominal terms**

When estimating cost of capital, it is necessary to include expected inflation because the return an investor requires includes compensation for reduced purchasing power of the currency over the life of the investment. Furthermore, cost of capital is the percentage return that equates expected economic income with present value. Thereby, in this context the expected rate of return is the discount rate. **(Pratt & Grabowski, 2008, p. 6)**

III.7.5. The relationship between risk and cost of capital

(Pratt & Grabowski, 2008, p. 39) pointed that the cost of capital is basically a combination of two factors:

- ✓ Risk-free rate: it is a rate of return that is free of default risk.
- ✓ Risk premium: is an expected amount of return over and above the risk-free rate to compensate the investor for accepting risk.

Therefore, the equation will be:

$$E(R_i) = R_f + RP_i$$

Where:
$E(R_i)$: is the expected return of security i.
R_f: is the risk-free rate.
RP_i: is the risk premium for security i.

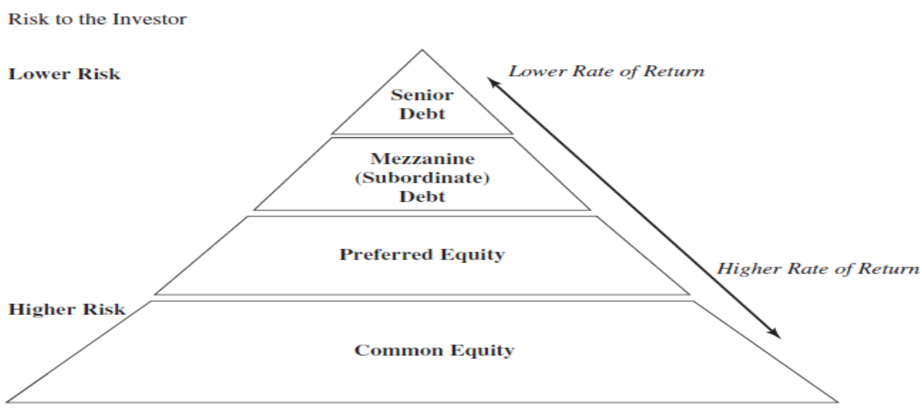
Moreover, risk is "the degree of uncertainty of achieving future expectations at the times and in the expected amount"

The risk-free rate is compensation of investors for renting out their money and it is observable in the market while risk premium is due to the uncertainty of expected returns. These two components of cost of capital varies from one investment to another **(Pratt & Grabowski, 2008, p. 40)**.

Each year cash flows varies thus the distribution of these cash flows can be expected to be risky. For that, it is necessary to determine the price of risk in the market. Consequently, investors will demand an added return if actual cash flows differ from the expected cash flows depending on the amount of expected dispersion that could occur. Moreover, there is business risk which is the risk of the company operations sales risk, profit margin risk and operating leverage risk. By looking at the capital structure of the company and cost of capital business risk can be identified. So by determining the overall company cost of capital, we can determine the required return for investors from business operations. Another risk, is financial risk which is the added volatility provides of equity capital. The leverage of financing increases the volatility to returns on common equity. **(Pratt & Grabowski, 2008, p. 40)**.

The following figure represents the risks of the components of the company capital structure

Figure (1.12): Risks of the components of the company capital structure



Source: (Pratt & Grabowski, 2008, p. 44).

To summarize, risk has an impact on the cost of capital and each of its component, therefore it has an impact on the weighted average cost of capital. As risk raises so does the cost of capital and thereby the value decreases.

In this context, capital market theory divides risk into three components:

- ✓ Maturity risk: this risk is also called horizon risk or interest rate risk. It is defined as the risk that the value of an investment can increase or decrease due to changes in the general level of interest rates. The longer term of the investment the greater the maturity risk.
- ✓ Market risk or systematic risk or undiversifiable risk: previously defined.
- ✓ Unique risk or unsystematic risk, residual risk or company-specific risk: previously defined. **(Pratt & Grabowski, 2008, p. 45)**

III.7.6. The estimation of Cost of capital

According to **(Pettit, 2007, p. 3)** the CAPM model is the most practical approach to determine a cost of equity by following these steps:

- ✓ Estimating the market risk premium (MRP) for equities;
- ✓ Measuring the systematic risk or beta of a company considering beta as the systematic risk measure **(Grabowski, Harrington, & Nunes, 2015, p. 39)**;
- ✓ Normalizing the riskless rate;
- ✓ Estimating an appropriate cost of debt;
- ✓ Estimating global capital costs;

- **Beta**

Beta is the measured risk as the standard deviation of the expected return from investment. However, we can reduce this volatility by a diversified portfolio. Meaning that we hedged the systematic risk, but for unsystematic risk or specific risk of a firm they cannot be hedged by the market. Therefore, the total risk is divided to systematic risk measured by beta and unsystematic risk. Beta belongs to the common “financial lingo” and it is published regularly by specialized sources.

“Beta measures the historical correlation of changes in the returns on the firm’s equity (share price and dividend income) and those on an overall market proxy such as S&P500”. The correlation indicates that the movements of both variables are linearly related in the proportion indicated by the coefficient. However, this coefficient does not explore the causes for this relation, if these are direct, indirect or unknown. Moreover, when the correlation coefficient value is +1 it means that there is a perfect positive correlation, when it equals to -1 is means that there is a perfect negative correlation and when it equals to 0 it indicates that there is no correlation. Thus, the correlation coefficient is calculated as follow:

$$\rho_{xy} = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$$

Where:

ρ: is the correlation coefficient.

x, y: are variables.

σ_{xy}: is the covariance between x and y.
σ_x: is the standard deviation of x.
σ_y: is the standard deviation of y.

Moreover, the concept of correlation is the basis to understand Beta. There are two formulas to calculate Beta.

- ✓ First formula of Beta: is by using the ratio of the covariance between the returns of the market and the firm to the variance of the market.

$$B = \frac{\rho_{JM}\sigma_J\sigma_M}{\sigma_M^2}$$

Where:
ρ_{JM}: is the correlation coefficient between the rents of J and those of the market portfolio M.
σ: is the standard deviation of each of the variables of either J or M.
σ_M^2: is the variance of the returns of the market portfolio.

If the beta coefficient is close to +1 it indicates that both returns on the market and the J share move in the same direction and by the same magnitude. While, if it equals to -1 it means that they move in the opposite direction by the same magnitude. And if it equals to 0 it means that movement in one variable would give us no information about the movements of the other.

- ✓ Second formula of Beta: using a regression analysis to estimate beta the regression is between the periodic returns of the market and those of the firm.

$$R = \alpha + \beta R_M + \varepsilon$$

Where:
R: is the periodic return.
α: is a constant term.
β: is the historical beta estimated for the corporation with respect to the market proxy.
R_M: is the periodic return of the market portfolio.
ε: is the error term which represents the part of the variation in the returns of the corporation which is unexplained by returns of the market portfolio.

- **Risk premium**

The market risk premium is estimated as the difference between return required by the investor from the overall equity market and the risk free rate. The return of an investment is calculated as follow:

$$R_j = R_f + \beta_j(R_M - R_f)$$

Where:
R_j: is the return of an investment
R_f: is the risk-free rate.
R_M: is the market return.

The risk premium is then calculated by dividing the reward (the market risk premium) by the beta of the asset as follow: **(Porras, 2011, pp. 43-52)**

$$Risk\ premium = \frac{(R_M - R_f)}{\beta_J}$$

III.7.7. The estimation of Cost of Capital using Capital Asset Pricing Model (CAPM)

As known, the risk is defined as the degree of uncertainty regarding expected future net cash flows and discount rate. In the CAPM, the discount rate or cost of equity capital is the combination of the risk-free rate and the premium for risk which compensates for interest rate, systematic risk and unsystematic risk. Hence, the CAPM model builds a relationship between risk and return. Interest rate risk or so called maturity or horizon risk is the risk that the value of investment may increase or decrease because of changes in the interest rates. While the systematic risk or market risk is the uncertainty due to the sensitivity of the firm's return to variability in return of the market. Moreover, unsystematic risks are specific risk that a company faces, where this risk arises from the unique factors of the firm.

The CAPM model is then:

$$E(R_j) = E(R_f) + \beta_j(R_M - R_f)$$

Where:

R_f: is the minimum level of expected return required from risk-free asset.

$R_M - R_f$: is the expected market risk premium used to encourage investors to move from risk-free to variable income investments.

β: is the systematic risk. **(Porras, 2011, p. 53)**

- **Assumptions of CAPM**
  - ✓ Investors hold well-diversified portfolios;
  - ✓ Investors wants to maximize their economic utility;
  - ✓ Investors are risk-averse;
  - ✓ Investors cannot influence prices;
  - ✓ Investors can lend and borrow at the risk-free rate;
  - ✓ There are no transaction costs or taxes;
  - ✓ Necessary information is free and accessible by all participants at the same time;
  - ✓ The traded securities are divisible into small parcels.

Hence, the main assumptions of the CAPM model are that investors are rational and risk-averse and they aim to maximize their economic utility. **(Porras, 2011, p. 55)**

According to **(Luehrman, 2009, p. 2)** in the CAPM model value maximizing investors will diversify, thereby they will face only risk premium which is non-diversifiable risk or systematic risk. And since the systematic risk are measured by beta which is a coefficient from a linear regression of a given risky asset's return on market returns, the relationship between risk and expected returns is linear.

III.7.8. The weighted average cost of capital (WACC)

The Weighted Average Cost of Capital is the average cost of the permanent financial resources of firm. The model aims to determine the components of the capital structure of the firm, their relative weights and the cost of each of the sources of funds and the most common method to value the cost is through an analysis of the future cash flows.

At a first place, it is important to distinguish between two related concepts, which are capital structure and financial structure.

Capital structure refers to the amount of permanent short-term debt, long-term debt, preferred stock and common equity used to finance a firm. While, financial structure is the amount of current liabilities, long-term debt, preferred stock and common equity. Thus, the capital structure is a part of the financial structure. **(Porras, 2011, p. 56)**

When calculating WACC, we work with market values and often tax basis and to carefully analyze the different items of capital structure of the firm.

- **Explicit cost of capital:** It reflects the discount rate that equates the cash inflows generated by the financing opportunity. **(Porras, 2011, p. 61)**
- **Implicit cost of capital:** Implicit cost of capital arises from forgoing other investment opportunities available to the funds in question. **(Porras, 2011, p. 65)**
- **Formula of WACC:**

$$K_A = \frac{E}{V}(K_E) + \frac{D}{V}[K_D(1-t]$$

Where:

K_A: weighted average cost of capital.

E: refers to equity.

V: refers to total value of the company.

K_E: refers to cost of equity.

D: refers to market value of debt.

K_D: refers to cost of debt.

t: refers to tax rate.

Moreover, if we include other sources of capital such as preferred stock and leases:

$$K_A = \frac{E}{V}(K_E) + \frac{P}{V}(K_P) + \frac{D}{V}[K_D(1-t] + \frac{L}{V}(K_L)$$

Where:

P: is the market value of the preferred shares.

K_P: is the cost of the preferred shares.

L: is the market value of the financial leases.

K_L: is the cost of the financial leases.

V: is the market value of the firm.

Thus: $V = E + D + P + L$ **(Porras, 2011, pp. 66-67)**

III.7.9. Aswath Damodoran model

According to **(Damodoran, 2016)** cost of capital is a weighted average of the cost of raising funding for an investment or a business using debt or equity. Thus, the cost of equity reflect the risk that equity investors suppose from the investment while the cost of debt reflect the default risk that lenders distinguish from the same investment.

Following this model, the cost of capital is calculated as follow:

$$cost\ of\ capital = cost\ of\ equity * weight\ of\ equity + cost\ of\ debt * weight\ of\ debt$$

Where:

$$cost\ of\ equity = risk\ free\ rate + risk\ premium$$

$$cost\ of\ debt = (risk\ free\ rate + defeult\ spread) * (1 - tax\ rate)$$

The weight of equity and debt is how much of each these sources are used in the financing of the investment.

Risk free rate: is defined as the rate of return you would expect to make on an investment with guaranteed returns.

Equity risk premium: is the premium that investors demand to invest in equities. Thus, the equity risk premium is the price of risk in the equity market.

Default spread: in the bond market, investors assess default risk and charge a default spread over the risk free rate when they price bonds. Hence, the default spread is the price of risk in the bond market.

III.8. Cost of Equity Capital

The term of cost of equity capital in finance is considered an important topic especially since the objective of a manager is to maximize the wealth of investors by the maximization of the present value of the future cash flow which is defined as the required rate of return of investors also called the cost of equity capital.

III.8.1 Cost of Equity Capital definition

According to **(Damodaran, 2011, p. 66)** the expected return on an equity investment in a firm given its risk has key implications for both equity investors in the firm and the managers in the firm . For equity investors it is the rate they need to make to be compensated for the risk that they have taken on investing in the equity of a firm. Moreover, **(Damodaran, 2006, p. 68)** defined cost of equity capital as what investors in the equity in a business expect to make on their investment".

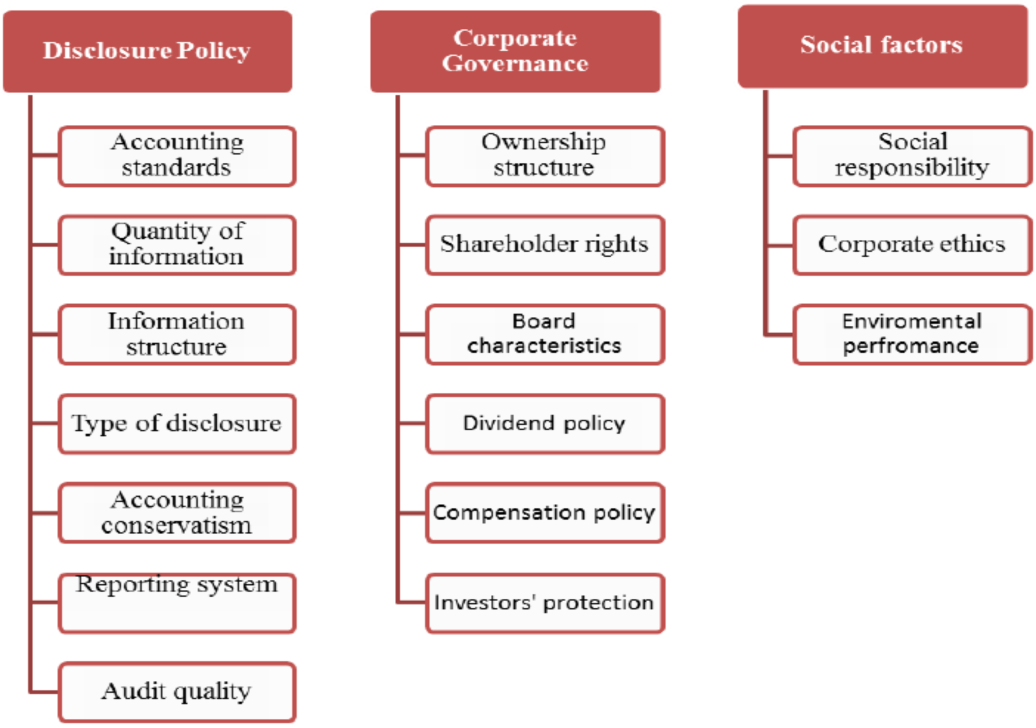
Furthermore, cost of equity is an implicit cost and cannot be directly observed and this expected rate also need to be the same for all equity investors in the same company. Hence, the challenge in cost of equity is first to make the implicit cost into an explicit cost by reading the minds of equity investors, and second is to come up with a rate of return that these diverse investors will accept as the right cost of equity in valuing the company. **(Damodaran, 2006, pp. 68-69)**

III.8.2 Internal and External Factors Influencing the Cost of Equity Capital

- **Internal factors**

following **(Mokhova, pp. 5-7)** internal factor that influence the cost of equity capital can be divided as follow:

Figure (1.13): Internal factors that influence the cost of equity capital



Source: (Mokhova, pp. 5-7)

The availability of information is an important factor in the decision-making process. Since, the inequality of available information between corporate managers and shareholders can create an information asymmetry. This later leads to an increase or high levels of cost of equity capital. Therefore, using the level of disclosure can reduce the information asymmetry which is considered as idiosyncratic volatility between managers and investors. Moreover, corporate disclosure is an essential part of corporate governance. In addition to the transparency of the information and its quality can decrease the information and agency risks. Thereby, we conclude that disclosure reduce the asymmetry of the information consequently it will reduce the cost of capital. The accounting information, accounting standards and corporate disclosure policy decrease cost of equity capital by:

- ✓ Optimal information structure (a mix of public and private information with higher share if public information);
- ✓ The quantity of information (enough quantity in order to increase the confidence of an investor in the market and decrease asymmetry information);
- ✓ The voluntary disclosure implementation;
- ✓ The disclosure of strategic events implementation.

As a conclusion, a company can manage its cost of equity capital by managing the internal factors such as the quality and quantity of accounting information, the accounting systems and standards and the type of disclosure. In addition, the strong corporate governance, the lower cost of equity capital because the agency problems will be decreased so does the information asymmetry and corporate governance will includes positive abnormal returns higher firms value, higher profits and higher sales growth.

Recently, social disclosure or social responsibility is has a significantly impact on cost of equity capital. Social responsibility is measured by the human resources, products and services, consumers, environment, competitor, miscellaneous, energy resources… etc. Hence, it will increase the attention of investors especially in social activities of the company, social policy… etc. According to Dhaliwal et al 2015 social responsibility disclosure and cost of equity capital are negatively correlated.

- **External factors**

For external factors that influences the cost of equity capital, financial stability is considered as the solution to control and manage cost of equity capital. Due to the increasing growth of financial transactions and the contagion effects of crises cost of capital instability can grow rapidly. So, the features of financial stability are low level of volatility of prices, exchange rate, interest rate, money supply…etc. This will lead to a decrease in cost of equity capital. **(Mokhova, pp. 7-8)**

III.9. Models of Cost of Equity Capital estimation

Cost of equity capital is estimated according to many methods. The main models are described below.

III.9.1. The original model of cost of equity

In the early sixties Gordon 1962 and Lintner 1963 examined the implications for the cost of capital of the constant expected growth rate stock value model as follow: **(Gordon & Gould, 1978, pp. 849-861)**

$$P = (1-b)y/(K-b_r)$$

Where:
P: is the present value of the firm's stock.
y: is the expected value of the firm's earnings in the coming year.
b: is the expected value of the firm's investment and retention rate for the indefinite future.
r: is the expected value of return on investment with investment the fraction b of earnings.
K: is the required return or yield at which the stock is selling.
Gordon and Lintner made the necessary assumptions to equate investment policy with dividend policy no stock financing and a constant debt equity ratio. Therefore, if r and K are functions of b, the potential derivative with respect to b is:

$$\frac{\partial P}{\partial b} = \frac{y}{(K-b_r)^2}\left[-K + b_r + (1-b)(r + b\frac{\partial r}{\partial b} - \frac{\partial K}{\partial b})\right]$$

$\acute{r} = r + b\ \partial r/\partial b$ Is the marginal rate of return on investment when investment is at the rate b.

If the previous equation equal to zero and solving for $\acute{r}$ we find that the value of P is maximized when b is set so that is satisfied.

$$\acute{r} = \frac{K - b_r}{(1 - b)} + \partial K/\partial b$$

Where:

$\acute{r}$: is the marginal rate of return on investment.

$\frac{K-b_r}{(1-b)} + \partial K/\partial b$: is firm's cost of capital.

And since the cost of capital is the discount rate which the firm should use in order to decide whether or not undertaking an investment will raise the value of a firm's stock. Thereby, if the value of $\acute{r}$ at some investment rate is above the right had of the previous equation taking the next investment will increase the value of the firm's stock and vice versa.

III.9.2. CAPM

Capital Asset Pricing Model was developed in the late 1950s and 1960s. a work of Harry Markowitz, William Sharpe, John Lintner and Jack Treynor. The main assumption of this model is that investors are rational and all informations are available in markets **(Vernimmen, 2005, p. 420)**. Moreover, **(Vernimmen, 2005, p. 420)** argued that CAPM have some properties defined as follow:

- ✓ The security market line: the security market line is calculated based on the expected return on the Y axis and the beta coefficient of each stock on the X taxis. It helps to determine the required rate of return on a security on the basis of the only risk that is remunerated "the market risk". It also characterizes the nature of changes in the markets and makes it easier to understand them. Moreover, market line serves as decision making tool.
- ✓ Linearity: according to CAPM model the measure of risk for individual assets is proportional to the weight of each security when the assets are combined into a portfolio. **(Vernimmen, 2005, p. 425)**

(Beltrame, Cappelletto, & Toniolo, 2014, p. 41) argue that the expected remuneration for shareholders depends on a risk-free rate, to which a premium for market risk weighted by e Beta, which represents a measure of the return reaction of the assets compared to the portfolio market return. However, this model is verified only if investors have sufficiently diversified portfolio.

- **Limits of CAPM**

CAPM model is under the assumption that the markets are efficient and it is widely used in modern finance, although it has limits such as:

- ✓ The limits of diversification: the CAPM model is a development of portfolio theory and is under the assumption that diversification reduce risk. With the entry of riskier companies such as biotechnology, internet and younger companies to the market, the correlation between market return and return on individual stock is falling. Thus, beta is becoming less relevant.
- ✓ Difficulties in practical application of the CAPM: the term risk-free means no risk of default and no coupon reinvestment risk. CAPM is usually used to value assets whose cash flows are spread out over time. Hence, we need to use a different discounting rate for each of the periods where each of these rates will be calculated with different risk-free rate and this complicates the use of this model.
- ✓ The instability of the β: CAPM is used to forecasts and to calculate expected return. Therefore, it would be better to use a forecast β rather than a historical value since beta is instable over time. Thereby, when calculating it is necessary to adjust the calculations in order to reflect the regularity of earnings and dividends and the visibility on the sector.
- ✓ Risk premium estimate and time diversification: equity premium is a function of the volatility of the economy and of the risk associated with a particular market. In order to estimate equity premium, the risk premium should be measured over the longest period possible due to the volatility of stock returns. Moreover, the type of average used is quite important when returns averaged are independent the best estimate of expected returns is arithmetic average; otherwise the geometric average is the best when return are not independent. Furthermore, the equity risk premium is measured by using two securities the short-term government bonds and the long-term government bonds. Risk premium also implies that stocks are riskier than bonds and it is calculated using the annual total returns of financial securities. In addition, when extending the holding period, it is possible that standard deviation decreases substantially for stocks and to lower extent for bonds and other less volatile securities. This effect is called time diversification. **(Vernimmen, 2005, pp. 425-428)**

Another assumption of CAPM model is that markets are fairly valued but technical analysis shows that market operators have doubts about market efficiency. However, the theory of efficient markets in general and the CAPM in particular is based on the rational expectations of market operators. **(Vernimmen, 2005, p. 429)**

- **Expended CAPM formula**

CAPM model has been expanded to include the size effect and company-specific risk, hence the formula of cost of equity capital will be as follow:

$$E(R_i) = R_f + \beta(RP_m) + RP_s \pm RP_u$$

Where:
$E(R_i)$: is the expected rate of return on security i.
R_f: is the rate of return available on a risk-free security as of the valuation date.
β: is beta.
RP_m: is the general equity risk premium.

RP_s: is risk premium for small size.
RP_u: is the risk premium attributable to the specific company where u refers for unique or unsystematic risk. **(Pratt & Grabowski, 2011, p. 41)**

II.9.3. Gordon's model

Gordon's model or constant dividend growth model derives the expected return of the equity in an explicit manner, by analyzing the cash flows produced by the investment as it is shown in the following equation:

$$P_O = \frac{D_1}{(R_E - g)}$$
$$D_1 = D_0(1 + g)$$
$$R_E = \frac{D_1}{P_O} + g$$

Where:
P_O: is the current market price of the common stock.
D_1: is the dividend to be paid in the next period.
R_E: is the return demanded from the company.
g: is the expected dividend growth rate.
Moreover, R_E the return required by shareholders is also called cost of equity:

$$K_E = \frac{D_0(1 + g)}{P_O} + g$$

Where:
D_0: is the last annual dividend paid by the company.

- **Limitations of Gordon model**
  - ✓ It is used only in companies which distribute dividends;
  - ✓ It is very sensitive to the estimated growth rate;
  - ✓ It does not consider risk explicitly.

Contrary to the CAPM model which recognize risk explicitly and it is used in all companies not only whom distribute dividends **(Porras, 2011, pp. 76-79)**.

III.9.4. Subjective or risk premium model

The idea of this model is the estimation of cost of equity without the need of historical time series data. Meaning that if the firm funds itself with both debt and equity, the cost of debt reflect all risks the firm assumes informed investors are willing to accept a rate K_D from the firm with its accompanying risk. In addition, ρ the supplementary premium needed to compensate informed investors for the additional risk which come from holding a common equity positions versus a fixed income position, thus the cost of equity capital is:

$$K_E = K_D = \rho$$

Where:
K_D: is the cost of debt before taxes.

ρ: is the subjective component. **(Porras, 2011, p. 80)**

III.9.5. Earnings-to-price approach

Following this approach, cost of equity is defined as the ratio of earnings per share to the current market price per share, that is:

$$P_0 = \frac{EPS_0}{R_{E,E/P}}$$

$$R_{E,E/P} = \frac{EPS_0}{P_0}$$

$R_{E,E/P}$: is the cost of equity according to the earnings-to-price.
EPS_0: is the current earnings per share ratio.
P_0: is the present value of a share.

Earnings can be accounting earnings, cash flows, dividends or any other measure of income.

The $R_{E,E/P}$ concentrates on the return offered by the investment over one period following the valuation date. Moreover, C is the capitalization rate, and it is used to capitalize the current earnings into the value of the firm. Thereby, when using the income approach to valuation, the capitalization rate is a function of the discount rate. **(Porras, 2011, pp. 80-81)**

III.9.6. Multifactor models

III.9.6.1. APT model

APT model is an extended version of the CAPM model and in practice it is hard to measure. This model is proposed by Stephen Ross. The assumption of this model is that the risk premium is a function of several variables macroeconomic variables and company "noise". So far security J:

$$r_J = \alpha + b_1 r_{V1} + b_2 r_{V2} + \cdots + b_n r_{Vn} + company - specific\ variable$$

Ross poses these following factors which are based on quantitative analyses:

- ✓ Nonanticipated variations in inflation;
- ✓ Nonanticipated variations in manufacturing output;
- ✓ Nonanticipated variations in the risk premium;
- ✓ Changes in the yield curve.

Hence, the risk premium is the sum of the risk premiums on each variable:

$$r_J - r_f = b_1(r_{V1} - r_f) + b_2(r_{V2} - r_f) + \cdots + b_n(r_{Vn} - r_f)$$

So we need firstly to identify the relevant variables of a single security, then to identify the corresponding risk premiums and lastly to measure the security's sensitivity to these variables.

If the β coefficients are zero, the risk premium is nil and the security's return is the risk-free rate. **(Vernimmen, 2005, pp. 429-430)**

III.9.6.2. The Fama-French model

Eugene Fama and Kenneth French 1995 have isolated three factors:

- ✓ Market return;
- ✓ Price/ book value;
- ✓ The gap in returns between large caps and small caps **(Vernimmen, 2005, p. 430)**.

According to the empirical study of Eugene Fama and Kenneth French they found that the CAPM cost of equity estimates for high-beta stocks were too high and for low beta stocks were too low. They also found that for high book-value-to-market-value stocks were too low and for low book-value-to-market-value stocks were too high. As conclusion if betas are not sufficient to explain expected return, CAPM model has fatal problems.

As a solution, they developed a three factor model under the assumption that investors are not constrained to behave rationally. The model's formula is:

$$E(R_i) = R_f + (\beta_i * ERP) + (\delta_i * SMBP) + (h_i * HMLP)$$

Where:
$E(R_i)$: is the expected return on subject security i.
R_f: is the rate of return on risk-free security.
β_i: is beta of a company i.
ERP: is equity risk premium.
δ_i: is small-minus-big coefficient in the Fama-French regression.
$SMBP$: is expected small-big risk premium estimated as the difference between the historical average annual returns on the small-cap and large-cap portfolios.
h_i: is high-minus-low coefficient in the Fama-French regression.
$HMLP$: is is high-minus-low risk premium estimated as the difference between the historical average annual returns on the high book-to-market and low book-to-market portfolios. **(Pratt & Grabowski, 2011, pp. 42-43)**

In order to determine risk it is better to separate liquidity premium from the so called size premium due to free float, transaction volumes and bid-ask spread. The criteria by which liquidity can be measured (size, free float, transaction volumes, bid-ask spread) are often statistically significant. Size premium is the additional remuneration because of the higher risk, therefore the higher cost of capital which is associated with the idea of smaller size of the company and of the trading volume. Previous studies expected return and the cost of capital are inversely related to liquidity, thereby it is easy to increase liquidity of the firm's stock but it is difficult to lower the risk. Thus, the firm will be able to reduce its cost of capital through liquidity enhancement than change its risk profile. Following (Mendelson and Amihud 2000) there exist two strategies to increase liquidity in corporation. The first strategy is that they could try to bring in more uniformed investors stock splits may be useful in this regard. And the second strategy is that they could disclose more information. Hence, the model will be: **(Vernimmen, 2005, p. 430)**.

$$K = r_f + \beta(K_M - r_f) + size\ premium$$

Moreover, Hamon and Jacquillat 1999 added the liquidity premium: **(Vernimmen, 2005, p. 431)**.

$$K = r_f + \beta(K_M - r_f) + \lambda * liquidity\ premium$$

According to **(Vernimmen, 2005, p. 432)** cost of equity capital arise where insider-trading laws are not enforced and legal protection of minorities is flawed. The legal system governing investors and markets can influence systematic risk in a given country, because it determines the level of protection giver to minority shareholders and other financial claimants. Additionally, companies in common law countries have higher valuations than companies in civil law countries and the growth rate in sales is higher in common law countries than those in civil law countries. Thus, they have better investment opportunities.

III.9.7. A priori models

Due to the problems of APT model, Chen, Roll and Ross 1986 suggested that one might instead specify the factors a priori assuming that:

- ✓ Stock returns are a function of:
  - Changes in industrial production(IP);
  - Unexpected inflation (UI);
  - The change in expected inflation(DEI);
  - The risk premium;
  - The steepness of the interest term structure (UTS).

Then, the model is:

$$R_j = \alpha + \beta_{IP}IP + \beta_{UI}UI + \beta_{DEI}DEI + \beta_{UPR}UPR + \beta_{UTS}UTS + \varepsilon$$

The expected return on equity is:

$$R_E = r_f + \beta_{IP}\lambda_{IP} + \beta_{UI}\lambda_{UI} + \beta_{DEI}\lambda_{DEI} + \beta_{UPR}\lambda_{UPR} + \beta_{UTS}\lambda_{UTS}$$

λ: is the risk premiums estimated by using cross-sectional regression for each date in the sample period and then average the estimated risk premiums. **(Porras, 2011, pp. 91-92)**

III.9.8. Industry index models

The industry index model is obtained by using the returns from a portfolio of stocks from firms belonging to the same sector. Hence, the return on equity is:

$$R_E = R_f + b_m\hat{\lambda}_m + b_I\hat{\lambda}_I$$

$\hat{\lambda}$: are the average risk premiums estimated as the priori model.

$$R_j = b_0 + b_m R_m + b_I R_I + \varepsilon$$

R_I: is the return on the industry index. **(Porras, 2011, p. 92)**

III.9.9. The build-up model

This model consists of two important components, risk-free rate and premium for risk including a general equity risk premium, a small company risk premium and a company-specific risk premium.

The formula of the build-up model for cost of equity capital is as follow:

$$E(R_i) = R_f + RP_m + RP_s \pm RP_u$$

Where:

$E(R_i)$: is the expected rate of return on security i.

R_f: is the rate of return available on a risk-free security as of the valuation date.

RP_m: is the general expected equity risk premium for the market.

RP_s: is the risk premium for smaller size.

RP_u: is the risk premium attributable to the specific company or to the industry (u refers to unsystematic risk).

- ✓ **Risk-free rate**

A risk-free rate is the return on a security free of risk of default. In this model the yield to maturity on US is generally used as risk-free rate such as using US government obligation of one of the following maturities in order to match the expected timing of cash flows: 30 days, 5years or 20 years.

As described earlier, risk-free rate include three factors rental rate, inflation and market risk or investment rate risk. These three factors embedded in the yield to maturity for any given maturity length. Moreover, this risk-free rate includes inflation thereby when the cost of capital is estimated the future net cash flows reflect the expected effect of inflation. **(Pratt & Grabowski, 2011, pp. 26-31)**

Moreover, the maturities are specified because build-up model incorporates a general equity risk premium based on historical data which is divided to short-term, intermediate term and long-term time series. In general analysts use the long-term US government bonds (20 years) for the following reasons:

- It matches the often-assumed perpetual lifetime horizon of an equity investment;
- The longest-term yields to maturity fluctuate considerably less than short-term yields;
- People are willing to recognize and accept that the maturity risk is embedded in this base or otherwise risk-free rate;
- It matches the longest-term bond over which the equity risk premium is measured in the Morningstar data series.

- ✓ **Equity risk premium**

For an equity investment, the investor will realize a return which has two main components:

- Distribution during the holding period;
- Capital gain or loss in the value of the investment.

Hence, this expected return is riskier than the interest and maturity payment on US government obligations. Thereby, investors require a higher return when investing in equities than investing in US government obligations. This excess return is called “the equity risk premium” or “market risk premium”.

- **Size premium**

Studies have improved that the degree of the risk and the cost of capital arise with the decreasing size of a company.

- **Company-specific risk premium**

First we have size smaller than the smallest size premium group where some studies believe that a size premium adjustment is warranted. For size premium the minimum average is set according to Morningstar by a market value if 1.575$ million to 74.9$ million, Duff & Phelps 111$ million… etc. so under these averages it should be done some adjustments.

Secondly, we have incorporating an industry risk factor into the build-up method where the addition to the build-up model was the industry risk premium so the formula became as follow:

$$E(R_i) = R_f + RP_m + RP_s \pm RP_i \pm RP_u$$

Where:
$E(R_i)$: is the expected rate of return on security i.
R_f: is the rate of return available on a risk-free security as of the valuation date.
RP_m: is the general expected equity risk premium for the market.
RP_s: is the size premium.
RP_i: is the industry risk premium.
RP_u: is the risk premium attributable to the specific company or to the industry (u refers to unsystematic risk).

Hence, the industry where the company operates may have more or less risk than the average of other companies which have the same size. So an adjustment of 100 to 200 basis point downward or upward maybe warranted.

Thirdly, we have volatility of returns which is another risk factor if it is higher, if the analysts prove that the returns of a company are unusually stable or volatile comparing to other companies, a necessary adjustment may be warranted. And lastly we have leverage which is the amount of debt capital compared to equity capital. Companies who have large amount of debt capital in their capital structure are more risky than others that have less debt. So, the cost of equity capital should be higher because it reflects a greater risk of using so much of debt in financing.

III.9.10. Implied cost of equity capital

The implied cost of equity capital is applying the DCF method in reverse (The Discounted Cash Flow Method is a method within the income approach whereby the present value of future expected net cash flows is calculated using a discount rate). In this method, current stock prices are equivalent to the expected future returns discounted to the present value at a discount rate which represents the company's cost of equity capital.

There are two main types of models used to implement the DCF method:

- ✓ The single-stage model: which is based on rewrite of a constant growth model like the Gordon Growth model and the formula is:

  $$PV = \frac{NCF_0(1+g)}{k_e - g}$$

  Where:

  PV: is the present value.

  NCF_0: is net cash flow in period 0, the period immediately preceding the valuation date.

  k_e: cost if equity (discount rate).

  g: is the expected long-term sustainable growth rate in net cash flow to investor.

  When the present value is known and the cost of capital is known, the following formula is used:

  $$k_e = \frac{NCF_0(1+g)}{PV} + g$$

- ✓ The multistage model: this model incorporates different growth rates for different expected growth stages. The formula for three stage model is as follow:

  $$PV = \sum_{n=1}^{5} \frac{[NCF_0\ (1+g_1)^n]}{(1+k_e)^n} + \sum_{n=6}^{10} \frac{[NCF_5\ (1+g_2)^{n-5}]}{(1+k_e)^n} + \frac{\frac{NCF_{10}(1+g_3)}{k_e - g_3}}{(1+k_e)^{10}}$$

Where:

NCF_0: is the net cash flow or dividend in the immediately preceding year.

NCF_5: is the expected net cash flow or dividend in the fifth year.

NCF_{10}: is the expected net cash flow or dividend in the tenth year.

$g_1, g_2\ and\ g_3$: are expected growth rates in NCF or dividends through each of stage 1, 2 and 3.

k_e: is the cost of equity capital or the discount rate. **(Pratt & Grabowski, 2011, pp. 43-44)**

III.9.11. Alternative methods for estimating the cost of capital

III.9.11.1. Direct calculation via the β of assets

In a company balance sheet, liabilities show the relationship between the asset side and the financial market. Hence, by applying CAPM model the required rate of return equal risk-free rate plus risk premium related to the activity of the company as follow: **(Vernimmen, 2009, pp. 448-451)**

$$K = r_f + \beta_A\ (r_M - r_f)$$

Where:

K: is weighted average cost of capital.

r_f: is risk-free rate.

r_M: is return of market.

β_A: is beta of asset or unlevered beta.

This β measures the deviation between its future cash flows and those of the market, it can be calculated following this equation:

$$\beta_{asset} = \beta_{equity}\frac{VE}{VE+VD} + \beta_{debt}\frac{VD}{VE+VD}$$

Or

$$\beta_{asset} = \frac{\beta_{equity} + \beta_{debt} * \frac{VD}{VE}}{1+\frac{VD}{VE}}$$

Where β_{debt} refers to the beta of the net debt and it is calculated by regressing the returns on listed debt against market returns of the debt of the same credit quality.

Another way to calculated β_{asset} under the proposition of Modgiliani and Miller 1963:

- ✓ First proposition is that the company can borrow at the risk-free rate no matter its capital structure is;
- ✓ And the second proposition is that the value of firm equals unlevered value plus the value of tax shield of debt. This later is calculated by the multiplication of product of net debt and corporate tax rate.

Hence, β_{asset} equals to:

$$\beta_{asset} = \frac{\beta E}{\left[1+(1-TC)\frac{VD}{VE}\right]}$$

However, these two propositions are unrealistic because the borrowing rate of companies with AAA rating includes a credit spread, and financial distress costs are not considered in the analysis.

III.9.11.2. Indirect calculation

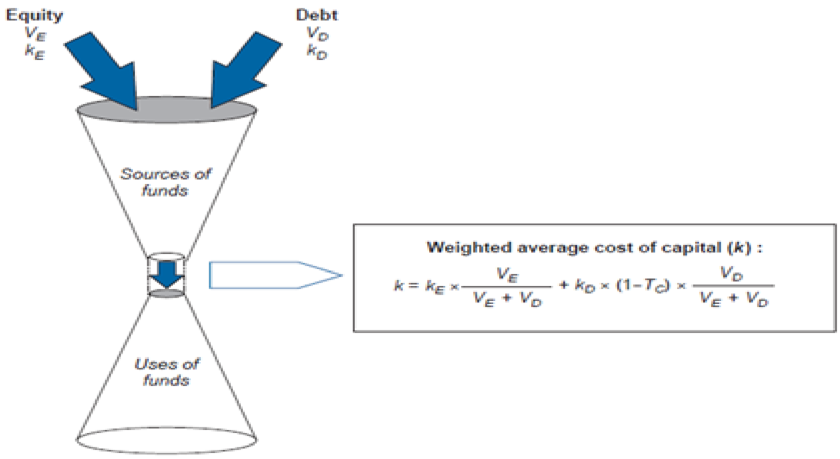
Following this method the weight average cost of capital is equal to:

$$K = K_E\frac{VE}{VE+VD} + K_D(1-TC)\frac{VD}{VE+VD}$$

This formula is the most frequently used method. However, it should be mentioned that the cost of equity and the cost of debt are not constant; they are a function of the company's structure. In addition, the higher debt the higher both cost of equity and cost of debt. **(Vernimmen, 2009, pp. 451-452)**

The following figure represents the weight average cost of capital in the context of this method:

Figure (1.14): The weighted average cost of capital



Source: (Vernimmen, 2009, p. 451)

III.9.11.3. The implicit calculation base on enterprise value

This method is rarely used its difficulties in determining the market-consensus for free cash flows. The formula is: **(Vernimmen, 2009, p. 452)**

$$V = V_E + V_D = \sum_{t=0}^{\infty} \frac{FC\,F_t}{(1+k)^t}$$

Moreover, according to **(Vernimmen, 2009, pp. 455-456)** in developing countries when estimating the cost of capital some problems raises such as the risk-free rate of local government bonds and betas of local peer groups are rarely measured due to the limited size of financial markets in these countries. Thereby, **(Vernimmen, 2009, pp. 455-456)** suggest the Bancel and Penotin's 1999 system for calculating the cost of capital in emerging countries markets:

$$\begin{aligned} &Cost\ of\ capital\ in\ an\ emerging\ market \\ &\quad = Government\ bond\ rate\ of\ the\ euro\ zone + sovereign\ spread + \beta_E \\ &\quad * European\ risk\ premium \end{aligned}$$

Where:

Sovereign spread: is bond yields issued on international market (euro or dollar) minus the bond yields offered by euro or dollar zone bonds. And this yield represents the political risk in the emerging countries.

β_E: is the beta of the sector of activity of developed financial markets and it measures the sensitivity of an industry's flows to the overall economic environment.

Conclusion

Through this chapter, we try to give a conceptual framework on financial derivatives, risks and performance measures, risk management in addition to theories on both capital structure and cost of capital.

We began this chapter by looking at the main fundamentals of derivatives instruments and how they are used and priced in the financial markets. In general, financial derivatives are contracts whose value is derived from more basic underlying. They can be used for hedging, trading or for speculation according to the objective of the trader. Moreover, we described their accounting treatment before and after the appearance of International Accounting Standards. Overall, before IAS the derivative instruments were included in off-balance sheet which allows companies to gamble with these instruments in order to create profits and receive bonuses before the appearance of losses, thereby IAS was set and made step to be followed in the accounting treatment in order to integrate derivative instruments in the balance sheet and at their fair value.

Then, in the second section we defined the main types of risks that banks faces and the management process of these risks following traditional and international techniques additionally to measurement tools of performance in banks.

In the last section, we started with the capital structure definition and its theories including the Miller-Modigliani theory, the trade-off theory, pecking order theory and market timing theory. We concluded that the capital structure is the mixture of debt and equity and the right mix of these two components is the mix that balances between the benefits of debt and the risk of bankruptcy. After that, we defined cost of capital including its components which are cost of equity capital and cost of debt. Generally, cost of capital is the required rate of return by investors. Hence, it is a function of the risk on the employed capital. Finally, we presented the estimation methods of cost of equity capital following the Capital Asset Pricing Model, the Weighted Average Cost of Capital, multifactor models including APT and Fama-French model, the build-up model…etc.

Chapter Two

Literature Review

Introduction

There exists a quite number of literature which attempts to explain theoretically and empirically the effect of using financial derivatives in firms.

In this context, the current chapter is divided into three sections of literature review. The first section has the aim to verify if firms by using derivative instruments increase or decrease their performance, while the second section represents previous studies on the effect of financial derivatives use on firms' risks. In the third section, previous studies on factors that affect cost of equity capital of firms is presented in addition to the relationship between financial derivatives usage and its effect on cost of equity capital.

Finally, the chapter summarizes the issues raised by all the studies presented in the previous sections and provides the contribution and the added value of the current research.

Section I. Literature review on derivatives usage and performance

There are a considerable number of literatures focusing on the effect of financial derivatives usage on firm performance, value and profitability. These studies can be divided in two groups.

The first group represents all previous studies focusing on financial firms. Regarding literature investigating the effect of using financial derivatives on banks' performance is limited to few studies.

I.1. Literature on the use of derivative instruments and performance

In the study of **(Minton, Stulz, & Williamson, 2009)**, they aim to investigate why banks are motivated to use financial derivatives; using a sample of 395 US banks from 2001 to 2005 they conclude that the use of credit derivatives by banks to hedge loans is limited.

In their analysis **(Rivas et al., 2011)** aim to analyze the impact of using financial derivatives on banks 'efficiency. In order to achieve this goal, he uses a sample of 182 banks from Brazil, Chili and Mexico during the period 2001 to 2002. The main conclusion of this study is that the use of financial derivatives increases the efficiency of banks.

In the paper of **(Said, 2011)** the objective is to analyze the effect of using financial derivatives on the performance of banks. Using 5 US banks from 2002 to 2009 the main conclusion of this study is that there is a positive effect of financial derivatives usage on performance of banks.

In investigating the determinants of the extent of Asia-Pacific banks derivatives activities **(Au Yong et al., 2014)** use 110 banks from Asia pacific countries during the period 2002 to 2003, they find that except for the non-dealer banks, the probability of financial distress and economies of scale arguments in explaining Asia-Pacific banks' extent of derivatives activities. Hence, the use of financial derivatives in banks reduces the probability of financial distress.

In their paper, **(Egly & Sun, 2014)** examine the effect of derivatives dealer on bank charter value during 2001-2011 using a sample of top 27 holding companies, the result conclude that the impact on BHC charter value become positive when trading income interacted with derivative dealer designation, in addition BHC increase risk through their off-balance sheet activities that generate volatile trading revenues, finally the impact of derivatives trading income on bank charter value using Tobin's Q is very small and seems to be tied to BHCs derivatives dealer trading designation.

Using the data of publicly and non-publicly 4404 traded bank holding companies during 1986- 2007 for testing the relationship between derivatives usage and loan growth by regression model, **(Brewer, Deshmukh, & Opiela, 2014)** conclude that loan growth is less sensitive to core deposit growth for interest-rate derivatives users than non-users, other finding shows interest- rate derivatives usage allows a more freely among various sources of funds thereby reducing their reliance on less interest-rate sensitive sources, finally the usage of derivatives and it cost have a negative effect on both financial stability and boarder resource allocation in the economy.

The aim of **(Mohamed Keffala, De Peretti, & Chan, 2015)** study is to explore the effect of financial derivatives usage on banks performance. Using 74 banks from both emerging and recently developed countries from 2003 to 2009 the study reveals that the use of derivatives contracts reduce the performance of banks.

To test the impact of derivative usage on bank stability in emerging countries from a sample of 66 banks using GMM Panel during 2003-2011, **(M. R. Keffala, 2015)** findings reveal that options and futures affect negatively the stability of banks from emerging countries. Forwards and swaps are not destabilizing derivatives. Options and futures can be considered as risky derivatives and partly responsible in the intensification of the last financial crisis.

(Anyango, 2016) try to examine the effect of financial derivatives usage on the financial performance of commercial banks from Kenya using 43 commercial banks from the period 2011 to 2015 the study shows that there is a negative effect of financial derivatives on banks financial performance.

The objective of **(Shen & Hartarska, 2018)** study is to evaluate the effect of using financial derivatives on profitability of banks before and during the 2008 financial crisis. Using a sample of 6921 community banks from 2003 to 2012 the study shows that the use of financial derivatives reduces the sensitivity of banks profitability to on-balance sheet credit risk and interest rate risk. Hence, the bank’s profitability improves using financial derivatives.

(Mohamed Keffala, 2019) aims to determine whether the use of financial derivatives increase or decrease the profitability of banks. Using GMM panel date of 22 Italian banks from 2005 to 2015, the results show that the use of financial derivatives increases bank’s profitability in Italy.

According to the previous studies results (Rivas et al., 2011); (Said, 2011); (Au Yong et al., 2014); (Egly & Sun, 2014); (Shen & Hartarska, 2018) and (Mohamed Keffala, 2019), the effect of financial derivatives usage on banks’ performance is positive. While, other studies find that the usage of financial derivatives affect negatively the performance of banks (Minton et al., 2009); (Brewer et al., 2014); (Mohamed Keffala et al., 2015) and (Anyango, 2016). Moreover, the study of (M. R. Keffala, 2015) separates the derivative instruments and concludes that forwards and swaps contracts affect positively banks stability while options and futures contracts affect the stability of banks negatively.

The second group provides the studies focusing on the relationship between financial derivatives and performance in non-financial firms.

In order to investigate the effect of foreign currency derivatives on firm value, **(Allayannis & Weston, 2001)** use a sample of 720 large US non-financial firms from 1990 to 1995. They conclude that the firms that use financial derivatives in their hedging policy have a higher value than the other firms that do not use financial derivatives.

In the study of **(Ben Khediri, 2010)** the aim of his study is to analyze the valuation effect of financial derivatives use in the French Market. Using a sample of 250 non-financial firms from 2000 to 2002 the results reveal that there is no effect of derivatives usage decisions on firm valuation and the extent of financial derivatives use is associated with lower firm value.

(Fauver & Naranjo, 2010) aim to examine the effect of agency costs and monitoring problems on derivatives usage in 1746 US firms from 1991 to 2000. The study shows that the value of firms with greater agency costs and monitoring problems is negatively affected by the use of financial derivatives.

(Bashir, Sultan, & Jghef, 2013) try to examine the effect of financial derivatives usage on 107 non-financial firms' value from Pakistan during the period 2006-2010. They find that the effect of derivatives usage is not significant when the value of the firm is measured using Tobin's Q while the use of foreign credit derivatives lower firm value and interest rate derivatives increase firm value when the measure of firm value is either the ratio of market value of equity to book value of equity or the ratio of market value of equity to total sales.

Using 282 non-financial firms from Europe from 2007 to 2012, **(Dijck, 2014)** find that there is a negative association between derivatives usage and firm value, thus the use of interest rate derivatives lower firm value.

In his paper **(Naveed, Chaudhry, Mehmood, & Mehmood, 2014)** use 75 non-financial firms from Pakistan during the period 2007 to 2011, he conclude that the use of financial derivatives has value relevance with firms where foreign exchange and interest rates derivatives are positively associated to firm value.

(Tahat & Obeid, 2014) try to determine the reasons why Jordanian firms use financial derivatives. Using 82 firms from Jordan the conclusion of this study is that the majority of firms use financial derivatives for hedging purposes against future transactions.

To explore the impact of using financial derivatives on both corporate debt capability and stock return in 583 non-financial firms from Korea during the period 2002 to 2012, **(Park & Kim, 2015)** find that the effect of financial derivatives is positive on debt capability due its negative effect on financial costs and by transferring risks. Thus, the use of financial derivatives tends to increase the performance of stocks.

(Ayturk, Gurbuz, & Yanik, 2016) aim through their study to examine the effect of financial derivatives on firms value from 2007 to 2013 using 204 non-financial firms from Turkey. The study shows that the use of financial derivatives does not affect firm value in Turkish market.

In investigating the effectiveness of the use of derivatives hedging in mitigating financial risk and hence increasing their performance, **(C. K. Lau, 2016)** use 362 non-financial firms from Malaysia during the period 2003-2012 and the main results of his study is that the usage of financial derivatives has a positive effect on firms' performance because derivatives contracts are used for hedging purposes. Consequently, firms that use derivatives contracts have a better firm market value than non-users.

In order to analyze the motivations of using financial derivatives in firm from GCC countries, **(Tanha & Dempsey, 2017)** examine 224 non-financial firms from 2006 to 2013 and they conclude that the main use of derivatives in GCC countries is to hedge foreign exchange exposure, interest rate risks and commodity risks.

The following table summarizes all the previous mentioned studies divided into two groups (financial and non-financial firms) with more details about methodology, sample and variables.

Table (2.1): Literature review on derivatives usage and performance

Group one: Literature on Financial Firms			
Author	**Aim**	**Methodology**	**Main results**
(Minton et al., 2009) “How much do banks use credit derivatives to hedge loans”	To analyze the reason why banks are motivated to use financial derivatives.	**Sample:** 395 banks from US. **Period:** 2001-2005. **Method:** Probit regressions and Panel data analysis. **Dependent variable:** Credit derivatives. **Independent variables:** Loan sales, securitization activities.	- The use of credit derivatives by banks to hedge loans is limited.
(Rivas et al., 2011) “Does the use of derivatives increase bank efficiency? Evidence from Latin America banks”	To examine the effect of financial derivatives usage on banks’ efficiency.	**Sample:** 116 Brazilian banks, 26 Chilean banks, 39 Mexican banks. **Period:** 2001-2002. **Method:** DEA and regression analysis. **Dependent variable:** Bank efficiency (DEA). **Independent variables:** derivatives, loans, equity ratio, total assets, economic and regulatory differences in the sample countries.	- The use of financial derivatives increases the efficiency of banks. - Bank size affects positively their efficiency. - Regulatory and institutional constraints affect negatively banks’ efficiency.
(Said, 2011) “Does the use of derivatives impact bank performance? A case study of relative performance during 2002-2009”	To analyze the effect of using financial derivatives on performance of US banks.	**Sample:** 5 US banks. **Period:** 2002-2009. **Method:** Regression analysis. **Dependent variable:** Derivatives. **Independent variables:** ROA, ROE, efficiency, cost of funding, earnings assets, NIM.	- A positive effect of financial derivatives on performance of banks.
(Au Yong et al., 2014) “Determinants of the extent of	To investigate the determinants of derivatives instruments use in	**Sample:** 110 banks from Asia-Pacific countries.	- Except for the non-dealer banks, the probability of

Asia-Pacific banks' derivative activities"	banks from Asia-Pacific countries.	**Period:** 2002-2003. **Method:** Regression models. **Dependent variable:** extent of derivative activities. **Independent variables:** Leverage, asset growth, bank size, liquidity, dividends, ownership structure, ownership dispersion, government ownership.	financial distress and economies of scale arguments in explaining Asia-Pacific banks' extent of derivative activities. - Thus, banks use derivatives to reduce the probability of financial distress.
(Egly & Sun, 2014) "Trading income and bank charter value during the financial crisis: Does derivatives dealer designation matter?"	To examine the effect of derivative instruments on banks value.	**Sample:** 27 bank holding companies from US. **Period:** 2001-2011. **Method:** Panel data analysis. **Dependent variable:** Tobin's Q. **Independent variables:** BHC total assets, net interest income std, trading derivatives income std, efficiency, GDP, crisis, non-trading derivative std, loans std, S and P500 ret, TB3MO, coredep-std.	- While trading income has a negative impact on BHC charter value suggesting that derivative activity is driven more by profit as opposed to hedging motives, the impact becomes positive when trading income is interacted with derivative dealer designation. - Dealer banks are well equipped to adequately manage risk and able to benefit from profitable trading activities that favorably impact BHC charter value. - BHC increase risk through their off-balance sheet activities that generate volatile trading revenues. - The impact of derivatives

			trading income on bank charter value using Tobin's Q is very small and seems to be tied to BHCs derivatives dealer trading designation. - Trading incomes are a modest fraction of net operating revenue, highly volatile, and did not contribute to overall BHC income during the crisis.
(Brewer et al., 2014) "Interest-rate uncertainly, derivatives usage, and loan growth in bank holding companies".	To investigate whether the use of financial derivatives have an effect on banks' loan growth.	**Sample:** Publicly and non-publicly 4404 traded bank holding companies. **Period:** from 1986 Q3 to 2007Q2. **Method:** Regression analysis. **Dependent variable:** Derivatives. **Independent variables:** Loan growth, core deposit growth, log of securities, log of assets, capital-to- assets, non-performing loans-to-total loans, extent of derivatives usage, core-deposits-to-total assets.	- Loan growth is less sensitive to core deposit growth for interest rate derivatives users than for non-users; this sensitivity is lower when the extent of derivatives usage is higher. - The funding flexibility enjoyed by BHCs using interest-rate derivatives should allow these BHCs to provide a smoother and higher level of intermediation, leading to more stable loan growth and greater economic stability. - Interest-rate derivatives

			usage allows a banking organization to move more freely among various sources of funds thereby reducing their reliance on less interest-rate sensitive sources. - The ability to substitute more freely among sources of funds provides a potential channel through which interest-rate derivatives usage has a positive effect on bank lending. - The use of derivatives and the cost of using them have negative implications for both financial stability and broader resource allocation in the economy
(Mohamed Keffala et al., 2015) "Effect of the use of derivative instruments on stock returns: evidence from banks in emerging and recently developed countries"	To explore the effect of using financial derivatives on banks' performance.	**Sample:** 74 banks from emerging and recently developed countries **Period:** 2003-2009 **Method:** Panel data analysis. **Dependent variable:** Stock returns. **Independent variables:** Derivatives (forwards, swaps, options and futures), capital, liquidity, loan, credit risk, NIM, non-NIM, size, dealer and country	- The use of derivative instruments reduces the performance of banks.

		as dummy variables.	
(M. R. Keffala, 2015) "How using derivatives affects bank stability in emerging countries? Evidence from the recent financial crisis"	To examine how using derivative instruments affect the stability of banks.	**Sample:** 66 Banks from emerging countries. **Period:** 2003-2011. **Method:** Panel data analysis. **Dependent variable:** Ln z (as measure of bank stability). **Independent variables:** Forwards, swaps, options, futures. Capital adequacy, credit risk, efficiency, income diversification on-balance sheet interest rate risk. GDP, bank sector of concentration (CR3 and CR5), bank market concentration, Inflation rate.	- Options and futures affect negatively the stability of banks from emerging countries. - Forwards and swaps are not destabilizing derivatives. - Options and futures can be considered as risky derivatives and partly responsible in the intensification of the last financial crisis.
(Anyango, 2016) "The effect of financial derivatives on the financial performance of commercial banks in Kenya"	To examine the effect of financial derivatives usage on commercial banks' financial performance.	**Sample:** 43 commercial banks from Kenya. **Period:** 2011-2015. **Method:** Regression analysis. **Dependent variable:** ROA. **Independent variables:** Derivatives, liquidity ratio, shareholders' equity ratio.	- A negative effect of financial derivatives on financial performance of banks.
(Shen & Hartarska, 2018) "Winners and losers from financial derivatives use: evidence from community banks"	To evaluate the effect of using financial derivatives on profitability of banks before and during the 2008 financial crisis"	**Sample:** 6921 community banks. **Period:** 2003-2012. **Method:** an endogenous switching regressions model. **Dependent variable:** ROA. **Independent variables:** interest rate risk, liquidity risk, credit risk,	- The use of financial derivatives reduces the sensitivity of banks profitability to on-balance sheet credit risk and interest rate risk. - The use of financial

		capital adequacy, management quality, derivatives.	derivatives improves banks' profitability.
(Mohamed Keffala, 2019) "Are Italian banks profitable by using derivatives? Evidence from the recent economic recession"	To determine the effect of financial derivatives usage on banks profitability.	**Sample:** 22 Italian banks. **Period:** 2005-2015. **Method:** GMM Panel data. **Dependent variable:** ROA, ROE. **Independent variables:** Derivatives overall, forward, options, swaps, futures, leverage, NIM, asset quality, the capital adequacy, liquidity, risky assets, bank size.	- The use of financial derivatives by Italian banks increases their profitability due to the positive association between derivative instruments and banks' profitability.
Group two: Literature on Non-Financial Firms			
(Allayannis & Weston, 2001) " The use of foreign currency derivatives and firm market value"	To investigate the effect if the foreign currency derivatives usage on firm value.	**Sample:** 720 large US non-financial firms. **Period:** 1990-1995. **Method:** Panel data analysis. **Dependent variable:** Firm value. **Independent variables:** size, access to financial markets, leverage, profitability, investment growth, industrial diversification, geographic diversification, industry effect, credit rating, time effects.	- Firms that have a hedging policy have an increase in value compared to firms that do not have a hedging policy. - Hence, the use of financial derivatives increases firms' value.
(Ben Khediri, 2010) "Do investors really value derivatives use? Empirical evidence from France"	To analyze the valuation effect of derivatives use in the French market.	**Sample:** 250 non-financial firms from France. **Period:** 2000-2002. **Method:** Linear regression and Panel data analysis. **Dependent variable:** The firm	- There is no effect of derivatives use decisions on firm valuation. - The extent of derivatives use is associated with lower firm value.

		market value. **Independent variables:** derivatives, size, leverage, profitability, investment growth, dividend, geographic diversification, industrial diversification.	
(Fauver & Naranjo, 2010) "Derivatives usage and firm value: The influence of agency costs and monitoring problems"	To examine whether the agency costs and monitoring problems affect derivatives usage.	**Sample:** 1746 firms from US. **Period:** 1991-2000. **Method:** Logit regressions and Panel data analysis. **Dependent variable:** Derivatives usage. **Independent variables:** Industrial segments, geographic segments, operating income-to-sales, capital expenditure-to-sales, log of total assets, leverage, dividend dummy, tax loss carry forwards-to-total assets, quick ratio, long-term debt ratio, agency cost measures, corporate governance measures, information asymmetry measures.	- Firms' value of firms with greater agency and monitoring problems is negatively affected by the use of financial derivatives.
(Bashir et al., 2013) "Impact of derivatives usage on firm value: evidence from non-financial firms of Pakistan"	To examine how firm value is affect by the use of financial derivatives.	**Sample:** 107 non-financial firms from Pakistan. **Period:** 2006-2010. **Method:** Panel data analysis. **Dependent variable:** Firm value represented in three measures: Tobin's Q, the ratio of market value of equity to book value of	- The effect of derivatives usage is not significant on firm value when measured using Tobin's Q. - The use of foreign currency derivatives lowers firm value. - The use of interest rate

		equity and the ratio of market value of equity to total sales. **Independent variables:** Derivatives, foreign currency derivatives, interest rate derivatives, firm size, leverage, liquidity, growth, ROA, dividends, geographic diversification.	derivatives increases firm value when it is measured using the ratio of market value of equity to book value of equity and the ratio of market value of equity to total sales.
(Dijck, 2014) "The use of interest rate derivatives and firm market value: An empirical study on European and Russian non-financial firms"	To analyze the effect of derivatives use on firm value of European non-financial firms.	**Sample:** 282 European non-financial firms. **Period:** 2007-2012. **Method:** Panel data analysis. **Dependent variable:** Firm value. **Independent variables:** Growth opportunities, profitability, size, leverage, industrial and geographical diversification, time and country effects, firm fixed effects, interest rate derivatives , other derivatives, dividend.	- The use of interest rate derivatives lowers firm value due their negative association.
(Naveed et al., 2014) "Dynamics of derivatives usage and firms' value"	To explore the impact of derivatives on firms' value.	**Sample:** 75 non-financial firms listed in Karachi stock exchange Pakistan. **Period:** 2007-2011. **Method:** Regression models. **Dependent variable:** Firm value. **Independent variables:** Foreign exchange derivatives, interest rate derivatives, size, leverage, ROA, ROE, dividend per share of firm, derivatives as dummy variable.	- Using financial derivatives has value relevance with firms. - Foreign exchange and interest rate derivatives are positively associated to firm value.

(Tahat & Obeid, 2014) "Usage of financial derivatives under IAS 39: evidence from the emerging capital market of Jordan"	To determine the corporate usage of derivatives for companies in Jordan.	A survey questionnaire to 82 companies (non-financial firms).	- The majority of firm use derivative instruments for hedging purposes against future transactions.
(Park & Kim, 2015) "Financial derivatives usage and monetary policy transmission evidence from Korean firm-level data"	To explore the impact of the use of financial derivatives on both corporate debts capability and stock return in non-financial firms from Korea.	**Sample:** 583 non-financial firms. **Period:** 2002-2012. **Method:** Panel data analysis. **Dependent variable:** debt to asset ratio, equity return. **Independent variables:** Derivatives, ROA, sales to asset ratio, logarithm of assets, industry effect and firm effect, stock market return, crisis as dummy variable, corporate leverage.	- The effect of financial derivatives is positive on debt capability due to the negative effect on financial costs and by transferring risks. - The use of financial derivatives tends to increase the performance of stocks.
(Ayturk et al., 2016) "Corporate derivatives use and firm value: evidence from Turkey"	To analyze the effect of financial derivatives use on non-financial firms' value.	**Sample:** 204 non-financial firms from Turkey. **Period:** 2007-2013. **Method:** Panel data analysis. **Dependent variable:** Firm value. **Independent variables:** Derivatives as dummy variable, extend of hedging, hedging accounting based derivatives use, firm size, profitability, leverage, investment growth, access to financial markets, industrial diversification, geographic diversification, currency position, liquidity, industry effect.	- The use of financial derivatives does not affect firm value in Turkish market.
(C. K. Lau, 2016)	To investigate the effectiveness of	**Sample:** 364 non-financial firms	- Derivatives usage has a

"How corporate derivatives use impact firm performance?"	the use of derivatives hedging in mitigating financial risk of firms and hence increasing their performance.	from Malaysia. **Period:** 2003-2012. **Method:** Two stage regression model. **Dependent variable:** Firm value (Tobin's Q), ROA and ROE. **Independent variables:** Derivatives, size, access, leverage, growth, ROA, industry and year as dummy variables, net profit margin and asset turnover.	positive effect on performance of firms. - Financial derivatives are used for hedging purposes. - Firms that use derivative instruments have a better firm market value than non-users.
(Tanha & Dempsey, 2017) "Derivatives usage in emerging markets following GFC: evidence from GCC countries"	To analyze the motivation of using derivatives in firms from GCC countries.	**Sample:** 224 non-financial firms. **Period:** 2006-2013. **Method:** Panel data analysis and Cross-sectional data **Dependent variable:** Use of derivatives as dummy variable. **Independent variables:** Size, ROE, gearing ratio, the market price-of-equity-to-book-value ratio.	- The main use of financial derivatives in GCC countries is to hedge foreign exchange exposure, interest rate risks and commodity risk.

Source: by the author.

I.2. Study contribution in comparison with the previous studies

The findings of the previous studies are different. Some studies find a positive relationship between the use of financial derivatives and the performance of firms such as **(Allayannis & Weston, 2001)**; **(Bashir et al., 2013)**; **(Naveed et al., 2014)**; **(Tahat & Obeid, 2014)**; **(Park & Kim, 2015)**; **(C. K. Lau, 2016)** and **(Tanha & Dempsey, 2017)**.

In contrast, the studies of **(Fauver & Naranjo, 2010)** and **(Dijck, 2014)** conclude that the association between financial derivatives usage and firms' performance is negative.
However, other studies such as **(Ben Khediri, 2010)** and (Ayturk et al., 2016) reveal that the use of financial derivatives does not affect firms performance

Most of literature focuses on the developing countries, especially the USA. Hence, there is a need to compare the use of derivatives and its effects on performance across emerging countries. In addition, there has been limited investigation into the effect of derivatives' usage on the performance of commercial banks, with the majority of studies focusing only on their effect on non-financial firms.

These limitations of the existing literature on the use of financial derivatives and its effects justify the present study. Hence, our research may prove useful in filling the research gap that exists in the literature and increase our understanding of the use of financial derivatives taken by banks from emerging markets.

Section II. Literature review on derivatives usage and risk

Researches regarding the increasingly important role derivatives in risk management in banks have large investigations. The following literature represents only studies on the banking sector.

II.1. Literature on the use of derivative instruments and risks

(Brewer Iii et al., 2000) investigate by the pooled cross-sectional time-series regressions, the relation between interest-rate derivatives and bank lending on 734 FDIC insured commercial banks greater than USD 300 million during the period (1985-1992), the result indicates that commercial and industrial loan growth is significantly and positively related to the beginning of period capital-asset ratios, and the previous period’s state-employment growth (EMPG). When using interest-rate derivatives, commercial banks reduce their systematic exposures of changes in interest rates and increase their ability to provide more C and I loans.

To examine derivatives activities and the risk of international banks use 7 large the US authorizes government security dealer banks and top 25 international commercial banks were chosen for the period of (1997-1995), by using CAPM, VaR and EVaR model **(Reichert & Shyu, 2003)** find that the use of options tends to increase all types of risk for US, European and Japanese banks. Interest-rate and currency swaps generally reduce banks risk, otherwise there is a negative correlation with market risk on US banks, finally futures and forwards contracts are generally not a flexible as swaps for hedging and not as cost effective as options or speculating.

(Minton et al., 2005) examine the use of credit derivatives by US bank holding companies from 1999 to 2003. They conclude that use of credit derivatives enable banks to save capital, although that at the same time it reduce their cost of loans and make banks more competitive with the capital markets for the provision of loans.

In his study **(Instefjord, 2005b)** try to achieve by the geometric Brownian notion the bellman principle to Dynkin’s formula if the credit derivatives increase the bank risk, the analysis identifies two effects, the first effect they enhance risk sharing as suggested by the hedging arguments, and they also make further acquisition of risk more attractive. The second effect they can destabilize the banking sector, other findings showed that financial innovation in the credit derivatives market may increase bank risk and the credit derivatives trading is a potential threat to bank stability even if banks use these instruments solely to hedge or securitize their credit exposures.

Using Fama-Mac Beth regression, cross-sectional analysis, and panel data on a sample of 8000 insured commercial bank in the US during 1980-2003, **(Purnanandam, 2007)** find that the interest rate risk has an impact on banks, and it provides a useful setting to test theories of risk management, in addition, derivatives user banks adjust their lending, and investing policies less than non- user, and the lending volume remains unaffected by the change in the fed fund rate suggests that the presence of derivatives can change the impact of monetary policies.

In their study, **(Au Yong et al., 2009)** examine the relationship between the derivatives usage and the interest rate, exchange rate exposure, using panel data and cross-sectional regression model from 1999 to 2003 for a sample of 110 banks from 10 Asia-Pacific countries, this study conclude that the use of derivatives does seem to reduce Asia Pacific banks short term interest rate exposure, but no their long term interest rate exposures, other finding showed that the positive LTIR exposures are driven by banks with extensive derivative activities, the last finding conclude that there is no significant evidence about the association between banks derivatives activities and exchange rate exposure.

In investigating the determinants of financial derivatives use and examine their effect on banks ‘risk, **(Shiu & Shin, 2010)** use a sample of 35 banks from Taiwan during the period 1998-2005. The main conclusion of their study is that the financial derivatives are used for risk management although there is no evidence that financial derivatives use has any effect on banks’ risk.

(Norden, Buston, & Wagner, 2011) investigate whether the use of credit derivatives in banks has an effect on their loan spread. Using 77 banks from 1997 to 2009 they find that the use of credit derivatives affect negatively corporate loan spreads. Hence, banks use credit derivatives for risk management purposes and pass the arising benefits on to borrowers.

Moreover, **(Mohamed keffala et al., 2012)** seek to investigate the effect of derivatives instrument use on capital market risk, for a sample of 52 bank from emerging and 9 banks from recently developed during 2003- 2009, using panel data, this investigation conclude that the use of options tends to increase all types of bank risk, swaps, forwards and futures negatively affect capital market risk, in other hand the options contract may be used for speculative purposes, while swaps, forwards and futures used for hedging.

Furthermore, examining whether the use of derivative instruments affects the risk of the bank in emerging and recently developed countries from 2003 to 2010 using a sample of 137 banks, **(Mohamed Keffala & de Peretti, 2013)** conclude that the use of forwards and swaps decrease the bank risk while the use of options have a positive effect on bank risk, futures have a mildly effect on bank risk, finally the majority of banks mainly use forwards and swaps for hedging, so banks are not at risk by using derivative instruments.

Using a sample of European listed banks consisting of the EU-15 countries and Switzerland from 1998 to 2012, **(Mano, 2013)** aims to identify whether the use of financial derivatives affect banks’ idiosyncratic risk and their systemic risk. He concludes that there is a positive relation between the use of derivatives and both idiosyncratic and systemic banks’ risk, indicating that the use of financial derivatives increases both idiosyncratic and systemic risks.

In their paper **(Pãun & Gogoncea, 2013)** use an analytical study in order to analyze the effect of financial derivatives usage on interest rate risk exposure in banks. They conclude that the use of financial derivatives increases banks’ efficiency and lower their financing costs. Hence, with the use of financial derivatives banks have better diversification and risk management.

To examine the impact of financial derivatives on banks’ systematic risks, **(Rodriguez-Moreno, Mayordomo, & Peña, 2013)** use a sample of 95 bank holding companies from US during the period 2002 to 2011. They find that banks that use foreign exchange and credit derivatives have higher systemic risk, while banks that use interest rate derivatives have lower systemic risks. In addition, non-performing loans and leverage have stronger effect on banks systemic risk than derivatives activities.

In order to know the impact of derivatives on risks of bank holding companies **(S. Li & Marinč, 2014a)** use time series regression model and panel data, during 1997-2012, and find that the use of derivatives is related positively to BHCs systematic exposures, and higher use of interest-rate, exchange rate, and credit derivatives correspond to greater their systematic risk, lastly trading or hedging purposes are associated with higher systematic risks of BHCs.

(Kornel, 2014) examines the effect of using derivatives on banks risk choosing a sample of 9 banks from Hungary from 2003 to 2012 and using a Panel date analysis, he finds that the use of futures, forwards and swaps tend to increase liquidity, leverage and credit risks while the use of options lower leverage, liquidity and credit risks.

(Si, 2014) seeks to analyze whether the use of financial derivatives has an effect on credit risk taking in banks. He uses 16 Chinese banks during the period 2007 to 2013 to achieve the objective of his study. He concludes that overall derivatives and both foreign exchange and interest rate derivatives affect positively bank credit risk taking.

To analyze why banks participate in derivative markets, **(K. Chen & Kim, 2014)** use 1519 commercial banks from US from 1995 to 2013. They conclude that banks speculate using interest rates derivative markets which are negatively related to their previous cash flows and net incomes. This indicates that banks speculate to make off-balance-sheet incomes to improve their profitability. In addition bank hedging derivatives activities are positively associated to the previous fluctuations in cash flows and liquidity in interest rates derivatives markets and FX markets. .

(González et al., 2015) analyze the effect of using credit derivatives on the overall risk of banks using a sample of 134 European financial firms from 2006 to 2010. The study shows that the use of credit derivatives for hedging purposes, banks improve their financial stability, while their use is for speculation it affect negatively their financial stability.

In order to determine the risk managements practices and to examine the use of financial derivatives in banks from Pakistan, **(Kouser, Mahmood, Aamir, & Bano, 2016)** use 36 financial firms listed on the Karachi stock exchange during the period 2005 to 2012. The study shows that firms are motivated to enter into derivative markets when they are in short of funds. Additionally, solvency and growth are positively related to derivatives usage and firms that have foreign business operation use financial derivatives as well.

Using a sample of 28 Indian banks from 1997 to 2005, **(Banerjee, Das, Jana, & Shetty, 2017)** aim to examine the effect of derivatives activities on the capital market risk. The main conclusions of this study are firstly the market risk of banks is positively related to the amount of derivatives use and the return on assets levels, secondly both total and specific risks of banks are affected by the amount of total assets, interest spread and their core capital to asset ratio. Lastly the bank ownership structure has no effect on capital market risk.

(Zakaria, 2017) present a new approach for measuring risk managements efficiency levels in banks using DEA analysis, he concludes that Japanese banks are superior in terms of managerial efficiency compared to European and US banks and the risk management using financial derivatives contributes to the strengthening of the efficiency levels of risk management.

In the paper of **(Huan & Parbonetti, 2019)**, they aim to test the relation between derivatives usage and banks' risk. Using a sample of 555 banks from eighteen developed markets during the period 2006 to 2015, they conclude that the use of financial derivatives increase banks 'risks.

The table below represents the mentioned studies with more details about methodology, sample and variables.

Table (2.2): Literature review on derivatives usage and risk

Author	Aim	Methodology	Main results
(Brewer Iii et al., 2000) "Interest –rate derivatives and bank lending"	To investigate the effect of derivative activities on banks' risks.	**Sample:** 734 FDIC-insured commercial banks with total assets greater than USD 300 million. **Period:** 1985-1992. **Method:** The pooled cross-sectional time series regressions. **Dependent variable:** C and I loan growth. **Independent variables:** Capital to asset ratio, C and I loan charge offs over assets, Employment growth, Log total assets, Lagged CILGA, Unused credit lines to total assets, Swaps, Futures, Dealer, Foreign.	- Commercial and Industrial loan growth is significantly and positively related to beginning of period capital-asset ratios. - C and I loan growth is statistically and positively related to the previous period's state – employment growth (EMPG). - Interest –rate derivatives allow commercial banks to lessen their systematic exposures to change in interest rates and by that increase their ability to provide more C and I loans (growth in C and I loans).
(Reichert & Shyu, 2003) "Derivative activities and the risk of international banks: A market index and VaR approach"	To examine the impact of derivatives use on banks' risks.	**Sample:** 7 large US authorized government security dealer banks and top 25 international commercial banks (foreign banks). **Period:** from 1995 to 1997 **Method:** CAPM, VaR and EVaR. **Dependent variables:** Futures, iswaps (the notional value of	- The use of options tends to increases all types of risk (interest-rate risk, currency risk and interest-rate risk beta for US, European and Japanese banks). - Interest-rate and currency swaps generally reduce

		interest rate swap contracts divided by total assets), cswaps (the notional value of currency swap contracts divided by total assets), Option, Capital market betas (βmt, βrt, βxt). **Independent variables:** Net interest margin, Log of total assets, Liquidity, Capital, rate of change in the ratio of provision for loan-loss reserves divided by total loans, C and I loans.	bank risk. - Interest-rate and currency swaps by US banks are negatively correlated with market risk. - Futures and forwards contracts are generally not a flexible as swaps for hedging and not as cost effective as options for speculating.
(Minton et al., 2005) "How much do banks use credit derivatives to reduce risk?"	To investigate the use of credit derivatives by US bank holding companies.	**Sample:** all US commercial bank holding companies with total assets greater than 1 billion dollar. **Period:** 1999-2003. **Method:** Probit regressions. **Dependent variable:** credit derivatives. **Independent variables:** Total assets, total loans, total deposits, total commercial and industrial loans, loans secured by real estate, agriculture loans, consumer loans, total foreign loans, ROA, ROE, NIM, total equity, capital dividend on total assets, total risk-adjusted capital ratio, tier 1 risk-adjusted capital ratio, total risk-adjusted assets/total assets, non-performing loans, liquid assets.	- The predictions of hedging theories are supported is this study. - The use of credit derivatives enable banks to save capital and at the same time it reduces their cost of loans and makes banks more competitive with the capital markets for the provision of loans.
(Instefjord, 2005a)	To investigate whether financial	Geometric Brownian notion, the	- The analysis identify two

"Risk and hedging: do credit derivatives increase bank risk?"	innovation of credit derivatives makes banks more exposed to credit risk.	bellman principle to dynkin's formula	effects of credit derivatives innovations: First effect they enhance risk sharing as suggested by the hedging arguments, and they also make further acquisition of risk more attractive. The second effect they can destabilize the banking sector. - Financial innovation in the credit derivatives market may increase bank risk (particularly those that operate in highly elastic credit market segments). - Credit derivatives trading are a potential threat to bank stability even if banks use these instruments solely to hedge or securitize their credit exposures. - The innovations that yield the most commercial success are precisely those that yield the minimum impact in terms of welfare.
(Purnanandam, 2007) "Interest rate derivatives at commercial banks: An empirical investigation"	To explore whether banks hedge their risks using financial derivatives.	**Sample:** 8000 Insured commercial banks from USA. **Period:** 1980 to 2003. **Method:** Fama –Mac Beth	- Interest rate risk has s significant impact on the banking sector and it provides a useful setting to

		regression, Cross Sectional Analysis, Panel data analysis. **Dependent variable:** A binary variable that equals one for the quarterly of failure and zero otherwise. **Independent variables:** Non-Performing Assets (NPA), the pseudo R^2 , Size, TD/TA refers to total deposit as a ratio of total assets, non-deposit liabilities, demand deposit, liquid assets, loans and leases, Net Income, C and I loans, quarterly growth rate, total equity, maturity gap, derivatives dummy, PD stands for the log likelihood of default.	test the theories of risk management. - The hedging activities of banks are consistent with theoretical models based on the cost of financial distress and costly external financing. - The user banks adjust their lending, borrowing and investing policies much less than non-user banks. - Derivatives user bank's lending volume remains unaffected (not sensitive) by the changes in the Fed funds rate suggests that the presence of derivatives contracts can change the impact of monetary policies on the aggregate lending volume in the economy. - The policymakers should consider the role of derivative instruments in setting monetary policies and evaluating their effects on the credit channels.
(Au Yong et al., 2009) "Derivative activities and Asia-	To examine how banks' risks are affected when using financial	**Sample:** 110 banks from 10 Asia-Pacific countries.	- The use of derivatives does seem to reduce Asia-

Pacific banks' interest rate and exchange rate exposures"	derivatives.	**Period:** From 1999 to 2003. **Method:** Panel and cross-sectional regression. **Dependent variable:** Interest rate and exchange rate exposure. **Independent variables:** Equity market return, long-term interest rate return, short-term interest rate return, exchange rate return, derivative activities, control variables (year dummy 1 if bank is an observation of year 2003, 0 otherwise) bank size, capital, liquidity, net interest margin, dealer dummy 1 if banks is a member of the international swaps and derivatives association and 0 otherwise, non-interest income, loans, credit risk.	Pacific banks STIR exposure but no their LTIR exposure because the level of derivatives activities especially interest rate derivatives is positively associated with long-term interest rate exposure (LTIR) but negatively associated with short-term interest rate exposure (STIR). - The positive LTIR exposures are driven by banks with extensive derivative activities (these banks are more likely to speculate with derivatives). - No significant evidence that banks derivatives activities are associated with exchange rate exposure.
(Shiu & Shin, 2010) "Determinants of derivatives use and its impact on bank risk"	To identify why banks use financial derivatives and examine the effect of using them on banks' risks.	**Sample:** 35 banks from Taiwan. **Period:** 1998-2005. **Method:** Panel data analysis. **Dependent variable:** Firm risk. **Independent variables:** Derivatives, firm size, affiliation to the holding firm, profitability, liquidity, dividend, issuance of	- Financial derivatives are used for risk management. - No evidence that derivatives use has any effect on banks' risks.

		preferred stocks, business diversification, diversification of revenues of costs of losses of long-term investments and liabilities, financial leverage, market value of equity, book to market ratio.	
(Norden et al., 2011) "Banks' use of credit derivatives and the pricing of loans: What is the channel and does it persist under adverse economic conditions?"	To investigate whether the use of credit derivatives in banks has an effect on their loan spread.	**Sample:** 77 banks from US. **Period:** 1997-2009. **Method:** Regressions analysis. **Dependent variable:** Loan spread. **Independent variables:** Bank and year as dummy variables, the sum of credit protection sold and purchased by a bank, the difference credit protection purchased and credit protection sold and borrower characteristics.	- The use of credit derivatives affect negatively corporate loan spreads. - Hence, banks use credit derivatives for risk management purposes and pass the arising benefits on to borrowers.
(Mohamed keffala et al., 2012) "The effect of derivative instrument use on capital market risk: evidence from banks in emerging and recently developed countries"	To determine the impact of the use derivative instruments in banks on their capital market risks.	**Sample:** 52 banks from 12 emerging countries and 9 from recently developed countries. **Period:** 2003-2009. **Method:** Panel data analysis. **Dependent variables:** Total risk, systematic risk and non-systematic risk. **Independent variables:** Derivative instruments (forwards, options, swaps and futures) , net interest margin, equity to total assets, liquid assets to total assets,	- The use of options tends to increase all types of bank risk (total return risk and unsystematic risk) for banks of any kinds. - Swaps, forwards, futures negatively affect capital market risk. - Option maybe viewed as speculative fashion while swaps, forwards and futures maybe used effectively as hedging

		gross loans to total assets, loan loss reserves to gross loans, size of the bank, dummy variables (dealer bank and country).	tools. - So the sample banks are not at risk by using derivative instruments because the majority of banks generally make use of forwards and swaps. Thus, the use of financial derivatives reduces capital market risks of banks.
(Mohamed Keffala & de Peretti, 2013) "Effect of the use of derivative instruments on accounting risk: evidence from banks in emerging and recently developed countries"	To explore how using derivative instruments affect accounting risks of banks.	**Sample:** 137 Banks, 74 banks from emerging countries and 63 banks from recently developed countries. **Period:** From 2003to 2010. **Method:** Panel data analysis. **Dependent variables:** Equity to total assets, liquid assets to total assets, gross loans to total assets, loan loss reserves to total assets, standard deviation of return before taxes on assets. **Independent variables:** Derivatives (forwards, options, swaps and futures), NIM, Size, dummy variables (deal and country).	- The overall results indicate that forwards have a negative effect on leverage risk and liquidity risk, swaps also negatively affect the two credit risk measures. In contrast, options have a positive effect on leverage risk and credit risk 1, and have a negative but weak effect on total risk. And finally, futures positively but mildly affect total risk. - Regarding main results collected from the two subsamples, we retain that in general the use of forwards and swaps decrease bank risk while the use of options positively affects bank risk

(Mano, 2013) "The impact of the derivatives' use as a hedging instruments in the European banking sector"	If using derivatives affect banks' idiosyncratic risk or the systemic risk.	**Sample:** European listed banks consisting of the EU-15 countries and Switzerland. **Period:** 1998-2012. **Method:** Panel data analysis. **Dependent variable:** Idiosyncratic volatility and beta. **Independent variables:** Derivatives, ROA, ROE, capital ratio, interbank ratio, liquid assets ratio, asset growth, loan to customer deposits ratio, tier 1 regulatory capital ratio, year as dummy variable.	- The use of financial derivatives has a positive effect on both idiosyncratic bank's risk and systemic risk. - Hence, the use of financial derivatives increases idiosyncratic and systemic risk.
(Pãun & Gogoncea, 2013) "Interest rate risk management and the use of derivatives securities"	To analyze the effect of financial derivatives usage on interest rate risk exposure in banks.	An analytical study	- The use of financial derivatives increases banks' efficiency. - The use of financial derivatives lowers banks financing costs. - With the use of financial derivatives banks have better diversification and risk management.
(Rodriguez-Moreno et al., 2013) "Derivatives holdings and systemic risk in the US banking sector"	To analyze the impact of financial derivatives on banks' systemic risk.	**Sample:** 95 bank holding companies from US. **Period:** 2002-2011. **Method:** Panel data analysis. **Dependent variable:** Systemic risk. **Independent variables:** Banks holdings of derivatives, size,	- Banks that uses foreign exchange and credit derivatives increases the banks systemic risk. - Banks that use interest rate derivatives decrease their systemic risk. - Non-performing loans and

		interconnectedness and substitutability, balance sheet information, aggregate systemic risk measure.	leverage have stronger effect on banks systemic risk than derivative activities.
(S. Li & Marinč, 2014a) “The use of financial derivatives and risks of US bank holding companies”	To analyze how bank holding companies use financial derivatives in order to hedge their risks.	**Sample:** US bank holding companies **Period:** from 1997 to 2012 **Method:** Regression models. **Dependent variables:** Stock return, market return, interest rate, exchange rate, credit risk. **Independent variables:** Interest margin, C and I loans, Mortgage loans, others loans, domestic deposits, Gap ratio, interest rate exposures, interest rate derivatives for trading and for hedging, interest rate derivatives, asset in foreign currencies, foreign exchange deposits, foreign exchange exposures, exchange rate derivatives for trading and for hedging, exchange rate derivatives, market liquidity, funding liquidity, non-performing loans, loan charge-offs, loan loss provisions, credit exposures, credit protection sold, credit protection bought, Gross credit protection, net credit protection bought, credit derivatives, size, capital ratio, GDP growth, tier 1	- The use of financial derivatives is positively and significantly related to BHCs systematic risk exposures. - Higher use of interest-rate derivatives, exchange rate derivatives and credit derivatives corresponds to greater systematic interest-rate risk, exchange-rate risk and credit risk. - The positive relationship between derivatives trading and risks as well as between hedging derivatives and risks. - It is difficult to determinate when financial derivatives are used for trading purposes and when for hedging purposes. Trading or hedging purposes are associated with higher systematic risks of BHCs this indicates that prohibiting financial

		ratio, income tax rate, crisis, SIFI, total financial derivative, financial derivatives for trading, financial derivatives for hedging.	derivatives for trading may give a false sense of safety because risks may then concentrate in financial derivatives for hedging purposes.
(Kornel, 2014) "The effect of derivative financial instruments on bank risks, relevance and faithful representation: Evidence from banks in Hungary"	To examine the effect of using derivatives in banks risks.	**Sample:** 9 banks from Hungary. **Period:** 2003-2012. **Method:** Panel data analysis. **Dependent variable:** Leverage risk, liquidity risk, credit risk, volatility of return on assets. **Independent variables:** Derivatives, natural logarithm of total assets.	- The use of futures, forwards and swaps tends to increase liquidity, leverage and credit risks. - The association between options and leverage, liquidity and credit risks is negative. - Overall, banks reduce their risks using financial derivatives.
(Si, 2014) "The use of derivatives and bank risk taking in China"	To analyze the effect of derivative usage on credit risk taking in banks.	**Sample:** 16 Chinese banks. **Period:** 2007-2013. **Method:** Two-Stage Least Squares regression. **Dependent variable:** Non-performing loans, substandard loan ratio, doubtful loan ratio, loss loan ratio. **Independent variables:** Derivatives, foreign exchange derivatives, interest rate derivatives, size, capital adequacy, liquidity level, ownership structure, market competition, economic growth	- Overall, derivatives and both foreign exchange and interest rate derivatives affect positively bank credit risk taking.

		level, and interest rate level.	
(K. Chen & Kim, 2014) “Why banks speculate and hedge on derivatives?”	To analyze why banks participate in derivative markets.	**Sample:** 1519 commercial bank from US. **Period:** 1995 Q1-2013Q4. **Method:** Regression analysis. **Dependent variable:** Derivative activities. **Independent variables:** Cash flow, ROA, liquidity, overall risk taking, the ratio of total equity to total assets, commercial and industrial loans ratio, deposits ratio, size, growth, ratio of total loans, total liquid assets.	- Banks speculate using interest rate derivatives markets are negatively related to their previous cash flows and net income. - This indicates that banks speculate to make off-balance-sheet incomes to improve their profitability. - Banks hedging derivative activities are positively associated to the previous fluctuations in cash flows and liquidity in interest rates derivative markets and FX markets.
(González et al., 2015) “The effect of credit derivatives usage on the risk of European Banks”	To analyze the effects of the credit derivatives use on the overall risk of banks.	**Sample:** 134 European financial firms. **Period:** 2006-2010. **Method:** GMM Panel data analysis. **Dependent variable:** Z score ratio as financial stability and risk of an entity proxy. **Independent variables:** net position of the hedging and trading portfolio of credit derivatives, loans/total assets, size, profitability, liquidity, NIM, efficiency ratio, interest rate risk,	- When using credit derivatives for hedging purposes banks improve their financial stability. - When the purpose of using financial derivatives is for speculation, their effect is negatively on banks’ financial stability.

		securitization.	
(Kouser et al., 2016) "Determinants of financial derivatives usage: A case of financial sector of Pakistan"	To determine the risk management practices and to examine the use of financial derivatives by banks from Pakistan.	**Sample:** 36 financial firms listed on the Karachi stock exchange (Pakistan). **Period:** 2005-2012. **Method:** Logit regression model. **Dependent variable:** Derivative usage. **Independent variables:** Firm size, firm age, liquidity, solvency, foreign business operations and growth opportunities.	- Firms are motivated to enter into derivative markets when they are in short of funds. - Solvency and growth are positively related to derivatives usage. - Firms having foreign business operations use derivatives.
(Banerjee et al., 2017) "Effects of derivatives usage and financial statement items on capital market risk measures of bank stocks: Evidence from India"	To examine the effect of derivative activities on the capital market risk.	**Sample:** 28 banks from India. **Period:** 1997-2005. **Method:** Panel data analysis. **Dependent variable:** Bank capital market risks (total risk, systematic risk, specific risk and interest rate risk). **Independent variables:** Derivatives, core capital, logarithm of total assets, interest margin, ROA, dummy variable firm private or public bank.	- Bank size, core capital to-risk adjusted asset ratio and interest spread of banks have an effect on both total and specific risks. - The growth in derivatives use and the return on assets of banks increases market risk of banks. - The core capital to-asset ratio and the interest spread have an effect on interest rate risk exposure. - Overall, systematic risks are affected by off-balance sheet derivatives, bank size and the core capital to risk adjusted asset ratios. - The bank ownership

			structure has no effect on capital market risk.
(Zakaria, 2017) "The use of financial derivatives in measuring bank risk managements efficiency: A data envelopment analysis approach"	To present a new approach for measuring risk management efficiency levels in banks.	**Method:** DEA analysis. **Outputs:** Customer deposits, mortgages, corporate and **commercial loans.** **Input:** Interest rate swaps.	- Japanese banks are superior in terms of managerial efficiency compared to European and US banks. - Risk management using derivatives contributes to the strengthening of the efficiency levels of risk management.
(Huan & Parbonetti, 2019) "Financial derivatives and bank risk: Evidence from eighteen developed markets"	To test the relation between derivatives and banks' risks.	**Sample:** 555 banks from eighteen developed markets. **Period:** 2006-2015. **Method:** Regression models. **Dependent variable:** Total risk, systematic risk, idiosyncratic risk. **Independent variables:** Derivative use, size, market-to-book ratio, non-earning assets, non-performing loans, liquidity, tier 1 capital ratio, exposure to credit risk, net interest margin, deposits interest coverage, cost to income ratio and return on assets.	- The use of financial derivatives increases banks' risks.

Source: by the author.

II.2. Study contribution in comparison with the previous studies

The literature findings show that the use of financial derivatives by banks is beneficial to them because by using derivative instruments banks are hedging their risks. This results is supporting by the studies of **(Brewer Iii et al., 2000)**; **(Minton et al., 2005)**; **(Purnanandam, 2007)**; **(Au Yong et al., 2009)**; **(Shiu & Shin, 2010)**; **(Norden et al., 2011)**; **(Pãun & Gogoncea, 2013)**; **(Kornel, 2014)**; **(González et al., 2015)**; **(Kouser et al., 2016)** and **(Zakaria, 2017)**.

In contrast, other studies find that financial derivatives usage increases banks risk such as the studies of **(Instefjord, 2005b)**; **(Mano, 2013)**; **(S. Li & Marinč, 2014a)**; **(Si, 2014)**; **(K. Chen & Kim, 2014)**; **(Banerjee et al., 2017)** and **(Huan & Parbonetti, 2019)**.

Moreover, some papers studied the effect of financial derivative instruments on banks' risk separately. The study of **(Reichert & Shyu, 2003)** reveals that options increase the risk of banks while swaps lower them. The same conclusion **(Mohamed keffala et al., 2012)** and **(Mohamed Keffala & de Peretti, 2013)** conclude in their study, that except for options all derivative contracts decrease the risks that banks face. Furthermore, the study of **(Rodriguez-Moreno et al., 2013)** find that foreign exchange and credit derivatives tend to increase risks in banks while interest rate derivatives decrease banks' risk.

The presented literature is focusing on the effect of financial derivatives usage in banks especially banks from developing countries. Thus, the current work will focus on banks from emerging countries in order to distinguish and compare the use of derivatives and its effects risk in banks across emerging countries.

However, other literatures have studied the effect of financial derivatives usage on both risk and performance in financial firms.

Using a sample of 18 large US bank holding companies from the second quarter of 2005 to the third quarter of 2008, **(L. Li & Yu, 2010)** finds that the participative banks of US bank holding companies use financial derivatives for speculation in the name of risk management while the dominants banks use derivatives for hedging purposes. As conclusion of this study using financial derivatives improve performance of banks and increase their overall risk level.

(Mohamed Keffala, 2012) examined the impact of derivatives usage on risk and performance on emerging and recently developed countries during 2003-2010 using CAPM, and panel data, the result showed that options have a negative /positive effect on capital market and banks risk respectively, but the usage of forwards and swaps decrease banks risk, futures have a mildly significance, other finding the use of swaps tends to decrease financial performance however, options, forwards and futures have no effect on stock returns, overall findings indicated that the use of derivatives reduce bank performance and risk.

(Fung et al., 2012a) investigate the effect of credit default swaps on both firm risk and value. During the period 2001 to 2009 using 191 insurance companies the results show that the use of credit defaults swaps increase firm market risk and reduce their value.

In order to analyze the impact of using financial derivatives on both banks risk and value **(Chang, Ho, & Jen-Hsiao, 2012)** use European commercial banks and banks holding companies operating in 25 countries. They find that the use of financial derivatives does not decrease banks' risk but it does increase the bank market value.

(Titova, Penikas, & Gomayun, 2018) analyze the association between value, performance and volatility of banks stock returns and the use of financial derivatives. During the period 2005 to 2010 and a sample of 109 publicly traded European banks, the study shows that when banks use derivatives for hedging purposes they reduce their risks and increase their value.

The table **(2.3)** describes all details about the mentioned studies.

Table (2.3): Literature review on derivatives usage and both risk and performance

Author	Aim	Methodology	Main results
(L. Li & Yu, 2010) "The impact of derivatives activity on commercial banks: Evidence from US Bank Holding Companies"	To analyze the purposes of derivative instruments usage by BHC.	**Sample:** 18 large BHC from US. **Period:** 2005Q2-2008Q3. **Method:** Panel data analysis. **Dependent variable:** ROA. **Independent variables:** The rate of non-traded derivatives, the rate of trading revenue, the rate of current credit exposure, logarithm of total assets, tier 1 leverage ratio, the rate of charge-offs.	- Participative banks of BHC use derivatives for speculation in the name of risk managements. - In contrast, dominant banks use derivatives for hedging purposes.
(Mohamed Keffala, 2012) "Risk and performance of derivative users: evidence from banks in emerging and recently developed countries".	To examine the association between financial derivatives usage and banks risk and value.	**Sample:** 74 banks from 13 emerging countries and 63 banks from 9 recently developed countries. **Period:** 2003 to 2010. **Method:** Panel data analysis. **Dependent variables:** banks' capital market risk (total, systematic and specific risks), banks accounting risks (leverage risk, liquidity risk, credit risk and overall risk), banks financial performance (stock returns) and accounting performance (efficiency, non-performing loans ratio, coverage ratio, ROA, ROE, capital adequacy, net interest margin).	- Except of options, derivative instruments affect negatively capital market risk. - In general the use of forwards and swaps decrease bank risk while the use of options positively affects bank risk, and finally the use of futures has mildly significant effect on bank risk. - The sample banks are not at risk by using derivative instruments because the majority of banks generally make use of

		Independent variables: Derivative instruments (forwards, futures, swaps and options), capital, liquidity, risky assets, net interest margin, bank size, on-balance sheet interest rate risk, leverage, dealer and country as dummy variables	forwards and swaps. - The use of swaps tends to decrease financial performance however forwards, options and futures have no significant effect on stock returns. - Banks from emerging countries results reveal that the use of options decreases their performance. - Findings about banks from recently developed countries expose that the use of forwards and more clearly of options diminishes their performance. - Overall findings indicate that the use of derivative instruments generally reduce bank performance. - In brief, deducing that by using derivatives banks decrease their performance but also their risk.
(Fung, Wen, & Zhang, 2012b) "How does the use of credit defaults swaps affect firm risk and value? Evidence from US Life	To investigate the effect of credit defaults swaps on both risk and value of firms.	**Sample:** 191 publicly traded insurance companies from US. **Period:** 2001-2009. **Method:** Heckman two-stage	- The use credit defaults swaps increases firm market risk and decrease their value at the same

and Property/casualty Insurance companies”		model. **Dependent variable:** Market risk and firm value measured using Tobin’s Q. **Independent variables:** Credit defaults swaps, underwriting behavior variables, investment behavior variables, regulatory variables, firm size, liability ratio, and rating.	time.
(Chang et al., 2012) “The effect of financial derivatives usage on commercial banks risk and value: Evidence from European markets”	To analyze whether the firm risk and value are affected using financial derivatives.	**Sample:** 355 observations of European commercial banks and bank holding companies operating in 25 countries. **Period:** 2004-2008. **Method:** Panel data analysis. **Dependent variable:** Bank risk and value. **Independent variables**: Derivatives, diversification, bank size, profitability, financial distress, risk exposure.	- The use of financial derivatives does not decrease banks’ risk. Meanwhile, it increases their market value.
(Titova et al., 2018) “The impact of hedging and trading derivatives on value, performance and risk of European banks”	To analyze the association between value, performance and volatility of banks stock returns and the use of financial derivatives.	**Sample:** 109 publicly traded European banks. **Period:** 2005-2010. **Method:** Regression analysis. **Dependent variable:** Stock	- When banks use financial derivatives for hedging purposes, they reduce their risks and increase their value at the same time.

		returns and standard deviation of stock returns. **Independent variables:** Derivatives, assets and liabilities fair value, equity, net income, ROAA, ROAE, liquid assets, income diversification, loans to total assets, non-performing loans, cost to income ratio, tier 1 ratio, hedging net fair value, trading net fair value.	

Source: by the author.

Focusing on banks for an example the study of **(Mohamed Keffala, 2012)** on banks from both emerging and recently developed countries reveals that the use of financial derivatives lowers both risk and performance of banks. In the study of **(Chang et al., 2012)** the use of derivatives does not reduce bank' risks but it increases their market value. Contrary to this result, **(Titova et al., 2018)** deduce that the use of derivatives by banks lowers their risk and increases their value.

Section III. Literature review on derivatives usage and cost of equity capital

Before presenting the studies on the effect of financial derivatives usage on cost of equity, we analyzed literature about cost of equity estimating methods, capital structure and the different factors that affect the cost of capital in general and the cost of equity capital in particular.

III.1. Literature on cost of equity capital

In order to estimate the cost of equity capital of firms, **(Phillips & Cummins, 2005)** use 172 publicly traded firms writing property liability insurance from 1997 to 2000 using CAPM, Fama-French three factor model and Full Information Industry Beta method. The study shows that in the CAPM and Fama-French three factor model it is necessary to use the sum-betas technique to control for infrequent trading. Additionally, the cost of capital estimates from Fama-French three factor model is higher than CAPM estimates method and the cost of capital varies according the size of the firm.

According to the study of **(Poshakwale & Courtis, 2005)** the higher levels of disclosure the lower cost of equity capital of banks. This result is based on an empirical study of 135 banks from Europe, USA, Canada and Australia during the period 1995-1999.

Using 89 banks from US, UK, France, Germany, Canada and Japan, **(King, 2009)** finds that from 1990 to 2009 cost of equity capital decreased in all countries except in Japan and after 2006 it increased. He also finds that because of the lower covariance of banks stock returns and market returns bank beta declines.

(Hearn & Piesse, 2009) aim to investigate the size and liquidity augmented capital asset pricing model in order to explain the cross section of expected returns in emerging markets. They use a sample of 354 African firms and their results are that the cost of equity capital is higher in the financial sector and lowest in the blue chip stocks of Tunisia, Morocco, Namibia and South Africa.

In their paper **(Huang, Dao, & Fornaro, 2014)** aim to determine the relation between fair value measurements and cost of equity capital and to identify the impact of corporate governance on this relation. They use 814 financial firms from 2008 to 2009 and the findings show that the association between cost of equity capital and more verifiable fair value assets is negative, while with less verifiable fair value assets is positive. This positive association is due to better corporate governance.

To propose a model of cost of equity capital estimation in banks, **(Beltrame, Grassetti, & Previtali, 2014)** use CAPM Beta and Capital at Risk model on 141 European listed banks from 2009 to 2013. The study shows that the Capital at Risk model is able to price both systematic and specific risks and the main strength of the B-CaRM model is that cost of equity capital is quantified in the same theoretical framework of the cost of debt coherently with Modigliani and Miller theorem.

(Toader, 2014) examine the association between high quality requirements and systematic risks. She uses a sample of 65 European banks from 17 countries from 1997 to 2011 to achieve her study objective. The main conclusion is that the higher amounts of tier 1 equity improve banks' stability and reduce the expected cost of capital.

In investigating the effect of discretionary disaggregation in mandatory risk disclosures, auditors conservatism on the implied cost of equity capital, **(Al-Hadi, Taylor, & Hossain, 2015)** use 141 financial firms from 6 GCC countries during the period 2007-2011. The findings show that the implied cost of equity capital is significantly negatively related to discretionary disaggregation in mandatory market risk disclosures. Moreover, when audited by conservative auditor, firm disclosing more disaggregation in mandatory risk disclosure have lower implied cost of equity capital.

The objective of **(Asal, 2015)** study is to estimate to cost of equity capital in the Eurozone. Choosing a sample of 140 banks from developed economies during the period 1999 to 2014 and using a GMM Panel data analysis he conclude that loading factor regulations, leverage, tier 1 capital and loan-to-deposit ratio are the most important factor to determine cost of equity capital in the banking sector. The findings also show that the increase in loading factor, tier 1 capital and regulations lead to an increase in the cost of equity capital. In contrast the higher the leverage and loan-to-deposit the lower cost of equity capital in the studied banks.

(J.-B. Kim, Ma, & Wang, 2015) examine the impact of financial development in China on firms' cost of equity capital using 1281 non-financial and financial firms from China during the period 1998-2008. They find the development of stock market lower the cost of equity capital especially in firms owned by state and firms with high growth potential or innovation intensity. Another finding is that the banking development marginally lowers the cost of equity capital where this effect is stronger in private owned enterprises. In addition, the lack of the banking competition and banking marketization and under-development of the non-state economy cause the weak effect of banking development on the cost of equity capital.

(Duygun, Shaban, Sickles, & Weyman-Jones, 2015) examine in their paper the role of the equity capital constraint in the determination of total factor productivity of the banking sector. They use 485 banks from emerging countries during the period 2005-2008. Their results show that the importance of the regulated equity capital ratio as a constraint on cost minimizing behavior.

(Bitar, Saad, & Benlemlih, 2016) seek to analyze the impact of various definitions of capital on bank risk and performance. They use a sample of 168 banks from 17 MENA countries during the period 1999 to 2013. The results show that banks with higher capital ratios have higher loan loss reserves and they are more efficient and more profitable. Moreover, in countries with good governance the impact of capital requirements on banks efficiency and profitability is important for too-big-to fail banks. Furthermore, higher capital in countries with an appropriate institutional environment can influence the investment strategies of larger banks.

To analyze the effect of liquidity levels and risks on the implied cost of equity capital, **(Saad & Samet, 2017)** use all equities from exchanges around the world during the period 1985 to 2012 and they conclude that shareholders require an extra premium for holding illiquid or high liquidity risk stocks. Hence, liquidity affects negatively the implied cost of equity capital.

(Kojima, Adhikary, & Mitra, 2017) seek to test the impact of shareholdings of banks on their earnings quality during the period 2006-2012 and using 1490 firms listed in the

Japanese stock exchanges. Firstly, they find that earnings quality of the main bank have been improved by the equity holdings. Secondly, the main banks reduce agency problems when they inject equity. Lastly, the equity ownership of the main banks helps improve earnings quality through effective monitoring.

(Derbali, Jamel, & Sy, 2017) examine the relation between the ownership structure quality of financial information and the cost of debt in firms from Tunisia. To achieve their study aim, they use 28 banks from 2007 to 2015 using Panel data analysis. Their results show that the value of the assets affects positively the cost of debt. In addition, the return on assets and return in equity have a positive effect on cost of debt. Moreover, the association between the concentration of property and the cost of debt is positive while the relation between the participation of institutional investors and the cost of debt is negative. Furthermore, managerial ownership is negatively related to cost of debt.

To explore the structure of cost of capital of banks from 1984 to 2016, **(Dick-Nielsen, Gyntelberg, & Thimsen, 2019)** use 1758 US banks and they conclude that when banks changes its capital structure investors do not change their required rate of returns on total portfolio of bank securities. In addition, the firm value loss due to lower tax shield would be a redistribution of taxation income for government.

The table **(2.4)** shows the different details of the presented studies.

Table (2.4): Literature review on cost of capital, cost of equity capital and capital structure

Author	Aim	Methodology	Main results
(Phillips & Cummins, 2005) "Estimating the cost of equity capital for property-liability insures"	To explore the methods of cost of equity capital estimation	**Sample:** 172 publicly traded firms writing property-liability insurance. **Period:** 1997-2000. **Method:** Estimating cost of equity capital using CAPM, Fama-French three factor method and Full Information Industry Beta method.	- In the CAPM and Fama-French three factor methods, it is necessary to use the sum-betas technique to control for infrequent trading. - The cost of capital estimates from Fama-French three factor method is higher than CAPM estimates method. - The cost of capital varies according to the firm size.
(Poshakwale & Courtis, 2005) "Disclosure level and cost of equity capital: Evidence from the banking industry"	To examine the association between disclosure level and cost of equity capital in the banking industry.	**Sample:** 135 banks from Europe, USA, Canada, Australia. **Period:** 1995-1999. **Method:** Disclosure scoring model. **Dependent variable:** cost of equity capital. **Independent variables:** Beta, the market value of equity, the book value of total assets and total revenues, the number of employees, firms' disclosure score, the number of analysts.	- The higher levels of disclosure the lower cost of equity capital in banks.

(King, 2009) "The cost of equity for global banks: A CAPM perspectives from 1990 to 2009"	To estimate the cost of equity capital of banks using CAPM.	**Sample:** 89 banks from US, UK, France, Germany, Canada and Japan. **Period:** 1990-2009. **Method:** Estimating cost of equity capital using CAPM.	- The real cost of equity capital decrease in all countries from 1990 to 2005 except in Japan. While after 2006 it increased. - The banking sector risk premium represents more than two thirds of the estimate. - Due to the lower covariance of bank stock returns and market returns, bank beta declines.
(Hearn & Piesse, 2009) "Sector level cost of equity in African financial markets"	To explore a size and liquidity augmented capital asset pricing model to explain the cross section of expected returns in emerging markets.	**Sample:** 354 firms from Africa. **Period:** 2002-2008. **Method:** Multifactor CAPM pricing model.	- The cost of equity is higher in the financial sector and lowest in the blue chip stocks of Tunisia, Morocco, Namibia and South Africa.
(Huang et al., 2014) "Corporate governance SFAS 157 and cost of equity capital: Evidence from US financial institutions"	To determine the relationship between fair value measurement and cost of equity capital and to identify the impact of corporate governance on the previous relationship.	**Sample:** 814 financial firms. **Period:** 2008-2009. **Method:** Regression models. **Dependent variable:** Cost of equity capital. **Independent variables:** The ratio of level 1 and 2 fair value assets to total assets, the ratio of level 3	- Findings show that the association between cost of equity capital and more verifiable fair value assets is negative; while with less verifiable fair value assets it is positive. - The positive relation

		fair value assets to total assets, leverage, liability to asset ratio, size, log of market value of common equity, book-to-market, the ratio of book value of equity to market value of equity segment square root, merger or acquisition, restructure, loss, log of number of year, growth material weakness, z score, gross list, specialist, year 2009 as dummy variable, finance firm industry, stock exchange markets as dummy variable.	between less verifiable fair value assets and cost of equity capital is due to better corporate governance.
(Beltrame, Grassetti, et al., 2014) "Banks, specific risk and cost of equity: The bank's capital at risk model"	To present a model in order to estimate the cost of equity of banks.	**Sample:** 141 European listed banks. **Period:** 2009-2013. **Method:** Capital at Risk model and CAPM Beta. **Dependent variable:** Cost of equity capital. **Independent variables:** Asset growth, asset density, size, year, non-performing loans, capital adequacy, profitability, operating leverage, credit risk.	- The bank capital at risk model is able to price the systematic and specific risks. - The main strength of the B-CaR model is that the cost of equity is quantified in the same theoretical framework of the coherently with Modigliani and Miller.
(Toader, 2014) "Estimating the impact of higher capital requirements on the cost of	To examine the association between high-quality requirements and systematic risk	**Sample:** 65 European banks from 17 countries. **Period:** 1997-2011.	- The higher amounts of Tier 1 equity improve banks' stability and reduce

equity: An empirical study of European banks"	and which improvement in quality of the bank's balance-sheet have an effect on the expected rate of return on equity.	**Method:** Regression models. **Dependent variable:** Equity beta. **Independent variables:** Financial leverage, tier 1 capital ratio, liquid asset ratio, ROA, loan loss reserve ratio, country effect, year dummy.	the expected cost of capital. - A positive association between capital structure and systematic risk of banks. - Strong balance-sheet capitalization reduces the probability of default.
(Al-Hadi et al., 2015) "Disaggregation auditor conservatism and implied cost of equity capital: An international evidence from the GCC"	To analyze the effect of discretionary disaggregation in mandatory risk disclosures, auditor conservatism on the implied cost of equity capital.	**Sample:** 141 financial firms from GCC countries. **Period:** 2007-2011. **Method:** Regression models. **Dependent variable:** Implied cost of equity. **Independent variables:** Disaggregation in market risk disclosure, the sum of the qualitative market risk disclosures and disaggregation in quantitative market risk disclosures, the total score of both VaR and Sen formats, beta, leverage, the third market risk exposure tabular, corporate governance level, country level, GDP.	- The implied cost of equity capital is significantly negatively related to discretionary disaggregation in mandatory market risk disclosures. - Firm disclosing more disaggregation in mandatory risk disclosure have lower implied cost of equity capital when audited by conservative auditor.
(Asal, 2015) "Estimating the cost of equity	To estimate the cost of equity capital of banks.	**Sample:** 140 European banks from developed economies.	- Loading factor, regulations, leverage, tier1

capital of the banking sector in the Eurozone”		**Period:** 1999-2014. **Method:** GMM Panel data. **Dependent variable:** Cost of equity capital. **Independent variables:** Leverage, tier1 capital, log of loan deposit spread, credit default swaps spreads, 3 months Euribor-Eonia spread, inflation rate.	capital and the loan-to-deposit ratio are the most important factor to determine cost of equity capital in the banking sector. - The increase in loading factor, tier 1 capital and regulations lead to an increase in cost of equity capital. - The increase in leverage and loan-to-deposits lead to a decrease in cost of equity capital.
(J.-B. Kim et al., 2015) “Financial development and the cost of equity capital: Evidence from China”	To examine the impact of financial development in China on firms’ cost of equity capital.	**Sample:** 1281 non-financial firms and financial firms from China. **Period:** 1998-2008. **Method:** Regression models. **Dependent variable:** Implied cost of equity capital. **Independent variables:** Stock market development measures, banking development measures, firm size, book value-to-the market value of equity, market beta, return momentum ratio of earnings to book value of equity,	- The stock market development lower cost of equity capital generally this negative effect is weak in firms owned by state and firms with high growth potential or innovation intensity. While, the banking development marginally lowers cost of equity. Although the effect is stronger in private owned

		leverage, inflation rate, cross-listing dummy variable, the implementation of the new accounting standards, the split-share structure reform, year dummy, industry effect dummy.	enterprises. - The lack of the banking competition and banking marketization and under-development of the non-state economy cause the weak effect of banking development on the cost of equity.
(Duygun et al., 2015) "How regulatory capital requirement affect banks' productivity: An application to emerging economies"	To examine the role of the equity capital constraint in the determination of total factor productivity of the banking sector.	**Sample:** 485 banks from emerging countries. **Period:** 2005-2008. **Method:** Panel data analysis. **Dependent variable:** Total costs. **Independent variables:** Loans, securities and investments, off-balance sheet income, total assets, deposits and short-term funding, equity-asset ratio.	- The importance of the regulated equity capital ratio as a constraint on cost minimizing behavior.
(Bitar et al., 2016) "Bank risk and performance in the Mena region: the importance of capital requirements"	To analyze the impact of multiple definitions of capital on bank risk and performance.	**Sample:** 168 banks from 17 MENA countries. **Period:** 1999-2013. **Method:** Regression models. **Dependent variables:** Loan loss reserves to gross loans, non-performing loans to gross loans, cost-to-income ratio, net income to total assets, NIM.	- Banks with higher capital ratios have higher loan loss reserves and they are more efficient and more profitable. - In countries with good governance, the impact of capital requirements on banks efficiency and

		Independent variables: Capital ratios, bank size, bank loan engagement, growth of total assets, income diversity ratio, bank cost or risk.	profitability is important for too-big-to fail banks. - Higher capital in countries with an appropriate institutional environment can influence the investment strategies of larger banks.
(Saad & Samet, 2017) "Liquidity and the implied cost of equity capital"	To analyze whether cost of equity and risks are affected by liquidity levels.	**Sample:** Equities for exchanges around the world. **Period:** 1985-2012. **Method:** Pooled cross-sectional time series regressions. **Dependent variable:** The average of cost of equity capital. **Independent variables:** Liquidity level, firm size, beta, leverage, book-to-market ratio.	- Shareholders require an extra premium for holding either illiquid or high liquidity risk stocks. Hence, liquidity affects the implied cost of equity.
(Kojima et al., 2017) "Does equity holding by main banks affect the earnings quality of client firms? Empirical evidence from Japan"	To test the impact of shareholdings of banks on their earnings quality.	**Sample:** 1490 firms listed in the Japanese stock exchanges. **Period:** 2006-2012. **Method:** Regression models. **Dependent variable:** Main bank 1 as identified by NIKKEI and main bank 2 for a firm based on the amount of borrowing. **Independent variables:** Domestic institutional	- Earnings quality of the main bank has been improved by the equity holdings. - The main banks reduce agency problems when they inject equity. - The equity ownership of the main banks helps improve earnings quality

		shareholding, foreign shareholding, executive shareholding, small shareholding, dominant shareholding, cross-shareholding and stable shareholding, firm size, leverage, market to book value, profitability, ownership concentration.	through effective monitoring.
(Derbali et al., 2017) "Do ownership structure and quality of financial information affect the cost of debt of Tunisian listing firms?"	To examine the relation between the ownership structure quality of financial information and cost of debt of Tunisian firms.	**Sample:** 28 banks from Tunisia. **Period:** 2007-2015. **Method:** Panel data analysis. **Dependent variable:** Cost of debt. **Independent variables:** The company's information disclosure, the size of a company, ROA, ROE, the percentage of capital represented by business leaders, the percentage of institutional shareholders of the company, the business capital concentration, the measure the company's total accruals.	- The value of the assets affects positively the cost of debt. - Return on assets and return on equity have a positive effect on cost of debt. - A positive association between the concentration of property and the cost of debt. - A negative relation between the participation of institutional investors and the cost of debt. - A negative association between the managerial ownership and cost of debt.

(Dick-Nielsen et al., 2019) “The cost of capital for banks”	To analyze the structure of cost of capital of banks.	**Sample:** 1758 US banks. **Period:** 1984-2016. **Method:** Analyst earnings forecasts. **Dependent variable:** Cost of capital. **Independent variables:** Tier 1 ratio, tier 2 ratio, deposit ratio, government support, bank fixed effects, time fixed effects.	- When bank changes its capital structure, investors do not change their required rate of returns on total portfolio of bank securities. - The firm value loss due to lower tax shield would be a redistribution of taxation income for the government.

Source: by the author.

III.2. Main conclusions on cost of equity capital literature review

Overall, the results show that only few literatures study the capital structure of banks and its effect on risks in banks. The study of **(Toader, 2014)** conclude that the capital structure affect positively European banks risks, while the study of **(Dick-Nielsen et al., 2019)** conclude that the changes in capital structure do not affect cost of equity capital in banks from US.

Furthermore, the study of **(Derbali et al., 2017)** shows that the increase in Tunisian banks' performance lead to an increase in their cost of debt and the managerial ownership reduce cost of debt in banks.

III.3. Literature on derivative instruments and cost of equity capital

Literature investigating the relationship between financial derivatives and cost of capital in general is limited.

(Che & Sethi, 2010) by their review paper they try to investigate the effect of credit derivatives on equilibrium debt contracts, they conclude that credit derivatives induce investors who are most optimistic about borrowers' revenues; thereby they will be natural purchasers of debt in order to sell credit protection instead. Thus, their cost of capital is affected.

In investigating the association between derivatives usage and the cost of equity of non-financial firms **(Gay et al., 2011)** use a sample of 1341 firms-years from 1992 to 1996 and then from 2002 to 2004. They conclude that firms' users of financial derivatives have a lower cost of equity capital than non-users firms. This negative relation can be explained by the fact that firms that use financial derivatives have a lower systematic risks and lower small minus big size beta. Consequently, the use of financial derivatives reduces financial distress risk and hence the required rate of return is lower.

In order to analyze the effect of financial derivatives use on companies' cost of equity capital, **(Ameer, Isa, & Abdullah, 2011)** use 200 companies from Malaysia during the period 2007-2008 to achieve the objective of their study. The results show that due to the complexity of derivative instruments and the lack of expertise in the sample companies, the use of financial derivatives is not useful and benefit to these companies. Additionally the cost of using financial derivatives is higher than their benefits. Hence, the relation between derivative instruments and cost of equity capital in these companies is not obvious.

In the study of **(Coutinho et al., 2012)** the aim is to analyze the cost of capital in non-financial firms when they use financial derivatives. To achieve this aim he uses a sample of 47 non-financial firms from Brazil during the period 2004-2010. He finds that the association between financial derivatives use and cost of capital is positive. This result means that the more firms use financial derivatives the more cost of their capital increases.

In their paper **(Dadalt, Lin, & Lin, 2012)** aim to determine the impact of derivative usage on utilization of external financing from 2002 to 2004 by using all non-financial firms comprising the entire S&P500. They achieve that there is a negative effect of derivatives usage on the use of the external financing. Thus, the use of financial derivatives affects cost of capital.

(J. Chen & King, 2014) explore the sources of hedging in firms and its effect on cost of debt. They use 2612 US firms from 1994 to 2009. They find that hedging lower cost of debt by reducing bankruptcy risk and information asymmetry level. Hence, a negative association is detected between hedging and cost of debt.

Through his study **(G. H. Kim, 2016)** analyze the effect of credit derivatives on firms cost of debt. To achieve the objective of his study he used 136 firms from US during the period 2001-2008. The findings show that firm with higher strategic default incentives have lower corporate bond spreads after the introduction of credit default swaps written on their debt.

To analyze the association between financial derivatives, hedging and cost of debt, **(Deng et al., 2017)** use 1140 bank holding companies from US during the period 1990 to 2011. Their study results show that the use of financial derivatives in banks reduce the exposure to tradable risk. Consequently, banks extent more loans causing a credit risk and thereby an increase in overall bank risk as a results the cost of debt is affect negatively by the use of financial derivatives.

(Ahmed et al., 2018) seek to explore the impact of derivatives use on the cost of equity capital in non-financial firms. To achieve this objective, they use 357 non-financial firms from Germany during the period 1999 to 2009. They find a negative relation between derivatives usage and the cost of equity capital especially in smaller firms and firms that use foreign currency and interest rate derivatives. They also find that the use of financial derivatives reduce financial distress risk.

In the study of **(Limpaphayom, Rogers, & Yanase, 2019)** the aim is to analyze the association between corporate hedging and equity ownership in banks. To achieve this aim they use 8595 firm-years observations from March 2010 to March 2017. The findings show that the association between bank equity ownership and corporate usage of derivatives is positive. Additionally, the use of financial derivatives affects positively firm value. Another finding is that bank equity ownership increases corporate hedging.

The details of the previous studies are summarized in table **(2.5)**.

Table (2.5): Literature review on derivatives usage and cost of equity capital

Literature on Non-Financial Firms			
Author	**Aim**	**Methodology**	**Main results**
(Che & Sethi, 2010) "Credit derivatives and the cost of capital"	To examine the effect of credit derivatives on equilibrium debt contracts.	An analytical (a review of paper).	- Credit derivatives induce investors who are most optimistic about borrowers' revenues. Thereby, they will be natural purchasers of debt in order to sell credit protection instead.
(Gay et al., 2011) "Corporate derivatives use and the cost of equity"	To examine whether the use of financial derivatives affect cost of equity of non-financial firms.	**Sample:** 1341 non-financial firms from US. **Period:** 1992-1996 and 2002-2004. **Method:** Pooled regression models. **Dependent variable:** Cost of equity capital. **Independent variables:** Derivatives, leverage, book-to-market, number of analysts, dollar trading volume, size, number of segments, % segments sales.	- Firms that use derivatives have lower cost of equity capital than non-users firms. - The lower cost of equity estimates of derivatives users is attributable in part to derivatives users having lower systematic risk and lower small minus big size beta. - Using financial derivatives reduce financial distress risk.
(Ameer et al., 2011) "A survey on the usage of derivatives and their effect on cost of equity capital"	To analyze the effect of financial derivatives usage on firms cost of equity capital.	**Sample:** 200 companies from Malaysia. **Period:** 2007-2008. **Method:** Regression models. **Dependent variable:** Cost of equity capital. **Independent variables:**	- Due to the complexity of derivative instruments and lack of expertise, the use of derivatives is not useful for the sample of the study. In addition, they have high costs compared

		Derivatives, size, leverage, the book-to-market ratio.	to their benefits. - The relation between derivatives and cost of equity capital is not obvious.
(Coutinho et al., 2012) “The use of FX derivatives and the cost of capital: Evidence of Brazilian companies”	To investigate the cost of capital of non-financial firms when they use derivative instruments.	**Sample:** 47 non-financial firms from Brazil. **Period:** 2004-2010. **Method:** Panel data analysis. **Dependent variable:** Weighted average cost of capital. **Independent variables:** Derivatives usage as dummy variable, leverage, firm size, profitability, operational risk, average debt duration.	- A positive effect of financial derivatives usage on cost of capital. This finding means that when firms use financial derivatives their cost of capital is increasing.
(Dadalt et al., 2012) “Do derivatives affect the use of external financing?”	To determine the impact of derivative usage on utilization of external financing.	**Sample:** All non-financial firms comprising the entire S&P 500. **Period:** 2002-2004. **Method:** Regression model. **Dependent variable:** External finance. **Independent variables:** Derivatives, the ratio of research and development expenses to total assets, dividend yield, working capital, cash deficit, sales growth, and size.	- A negative effect of derivatives usage on the use of external financing.
(J. Chen & King, 2014) “Corporate hedging and the cost of debt”	To explore the sources of hedging benefit in lowering cost of debt.	**Sample:** 2612 US firms. **Period:** 1994-2009. **Method:** Multivariate regression models.	- Hedging lowers cost of debt. - Hedging lowers bankruptcy, risk and

		Dependent variable: Derivatives. **Independent variables:** Tax convexity, leverage, interest coverage, z score, market-to-book, profitability, earnings volatility, firm size, private debt ratio, credit rating, market credit premium, interest rate level, equity market premium, industry as dummy variable, slope, SMB and HML from Fama-French three factor risk.	information asymmetry level. Hence, cost of debt is decreased.
(G. H. Kim, 2016) "Credit derivatives as a commitment device: Evidence from the cost of corporate debt"	To analyze the effect of credit derivatives on cost of debt.	**Sample:** 135 firms from US. **Period:** 2001-2008. **Method:** Regression model. **Dependent variable:** Bond yield spread. **Independent variables:** Credit default swaps trading indicator, CEO shareholding asset intangibility, the dispersion of bond holders, credit rating, information transparency, bond liquidity.	- Firms with high strategic default incentives have lower corporate bond spreads after the introduction of credit default swaps written on their debt.
(Ahmed et al., 2018) "Does derivatives use reduce cost of equity?"	To investigate if using financial derivatives lowers cost of equity capital of non-financial firms.	**Sample:** 357 non-financial firms from Germany. **Period:** 1999-2009. **Method:** Multivariate regression model. **Dependent variable:** Cost of equity capital. **Independent variables:**	- A negative relation between derivatives use and the cost of equity capital especially in smaller firms and firms that use foreign currency and interest rate derivatives.

		Derivatives use, leverage, book-to-market, illiquidity, size, number of segments, segments sales, ownership.	- Using financial derivatives reduce financial distress risk.
Literature on Financial Firms			
(Deng et al., 2017) "Derivatives-hedging, risk allocation and the cost of debt: Evidence from Bank holding companies"	To analyze the relation between derivatives, hedging and cost of debt.	**Sample:** 1140 bank holding companies from US. **Period:** 1990-2011. **Method:** The two-stage least square technique. **Dependent variable:** Derivatives. **Independent variables:** Bond yield spread, derivative skill, size, return volatility, net interest margin, capital adequacy ratio, notes and debentures, dividend payout ratio, liquidity ratio, GAP ratio, net charge-off.	- By using financial derivatives, banks reduce their exposure to tradable risk. Consequently, banks extend more loans causing a credit risk and thereby an increase in overall bank risk. As a result, a negative effect of using derivatives on cost of debt.
(Limpaphayom et al., 2019) "Bank equity ownership and corporate hedging: Evidence from Japan"	To analyze the association between corporate hedging and equity ownership in banks.	**Sample:** 8595 firm-year observations from Japan. **Period:** March 2010- March 2017. **Method:** Multiple logistic regression analysis. **Dependent variable:** Derivatives use. **Independent variables:** Equity ownership, debt holdings, bank board representation, firm size, financial leverage, profitability, growth opportunities, asset tangibility, liquidity, systematic	- The association between bank equity ownership and corporate usage of derivatives is positive. - The use of derivatives affects positively firm value. - Bank equity ownership increases corporate hedging.

		risk.	

Source: by the author.

III.4. Study contribution in comparison with the previous studies

All previous studies have studied the effect of using financial derivatives on cost of capital in general and cost of equity in particular but in non-financial firms. The results of both (Gay et al., 2011) and (Ahmed et al., 2018) show that the use of financial derivatives reduces cost of equity and financial distress. In the same results, the study of (J. Chen & King, 2014) concludes that the cost of debt is lower in firms that uses financial derivatives. In contrast, the study of (Coutinho et al., 2012) shows that derivatives increases cost of capital. However, the study of (Dadalt et al., 2012) reveals that the use of financial derivatives lower the use of external financing.

To our knowledge, only the study of (Deng et al., 2017) focuses on the effect of derivatives usage and cost of debt in banks from US. The results show that the use of financial derivatives by banks tends to decrease their cost of debt.

The limited number of literature focuses on the developing countries and only on non-financial firms. In addition, there has been limited investigation into the effect of derivatives' usage on the cost of capital of commercial banks and to our knowledge none of the previous studies have studied the effect of financial derivatives usage on cost of equity capital of banks although the importance of capital requirements recently in banks according to Basel III.

These limitations of the existing literature on the use of financial derivatives and its effect on cost of equity capital justify the current study.

Conclusion

This chapter tried to analyze the different studies dealing empirically with the effect of using financial derivatives on performance, risks and cost of capital in firms. For that reason, the chapter has been divided into three sections; the first section represents how performance of financial and non-financial firms is affected by the use of financial derivatives. The second section show the effect of financial derivatives usage on banks' risks while the third section provide a set of empirical works analyzing the capital structure, factors that affect the cost of capital and the relationship between financial derivatives usage and cost of capital and cost of equity capital mainly in non-financial firms.

Although this research has benefited from the previous studies in both conceptual and empirical framework and it shares several points with them, it has specific issues which can be considered as a contribution in the scientific research. The current research is different from the other previous studies in some important points.

Firstly, regarding previous studies there was only a limited number of empirical studies that examine the effect of using derivatives instruments in emerging countries, the majority of the studies focus only on developed countries. However, the current study analyzes this effect by focusing on emerging countries.

Secondly, the current study provides an empirical analyze on the use of derivative instruments by banks from emerging countries using different performance and risk measures.

Finally, this research investigates the relationship between financial derivatives usage and cost of equity capital in financial firms which has not been taken into consideration in the previous empirical studies.

In order to achieve this objective, this study uses a sample of financial firms from emerging countries which will be discussed in details in the next chapter.

Chapter Three

The Empirical Study

Introduction

The current chapter has the purpose to check up whether the usage of financial derivatives in banks from GCC countries has an effect on bank performance, risk and cost of equity capital.

To achieve this purpose, three sections are performed. The first section analyses the effect of financial derivatives use on bank financial and accounting performance while the second section examine the effect of derivative instruments on banks' capital market risk and accounting risks as well. The third section has the aim to investigate empirically how financial derivatives affect the cost of equity capital of banks.

In each section, we present the data and sample used in addition to the methodology by describing the variables used in the empirical model and testing the hypotheses of the study. After that, an empirical analysis is done on the model following an empirical methodology by starting with the unit root test and descriptive statistics then the regression estimation followed by a statistic analysis and other tests of specification and lastly presenting the evaluation of the empirical results with a scientific discussion and comparing the results with the economic theory and literature results in order to accept or reject the study hypotheses.

Section I. The effect of financial derivatives on performance of banks

The main purpose of this section is to investigate empirically how financial derivatives affect both the financial and accounting performance of banks. First, we will measure the financial performance of banks using stock returns of each banks individually following (Mohamed Keffala et al., 2015). Then, we will use the accounting performance measures such as Return on Assets, Return on Equity, Net Interest Margin and Cost to Income Ratio following literature (Said, 2011); (Mohamed Keffala, 2019).

I.1. The effect of financial derivatives on banks' financial performance

This part aims to examine the effect of derivative instruments on financial performance of banks. Therefore this section is organized as follow: Data and sample are described, as well as the methodology in first place then estimation results and analysis and lastly summaries and discussions are presented.

I.1.1. Data, Sample and Methodology

I.1.1.1. Data

The financial performance of banks is measured by stock returns. In order to determine daily stock returns of banks of each country, daily stock prices were drawn from Thomson Reuter's database. The used formula is as follows:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad \dots equation\ (1)$$

In addition, accounting data of banks drawn from bank focus data base are used as independent variables covering the period 2006-2018.

I.1.1.2. Sample

The following table represents the list of banks and their countries:

Table (3.1): Bank names and their countries

Countries	Bank names
United Arab Emirates	1. Emirates NBD PSG
	2. Abu Dhabi Commercial Bank
	3. Mashreq Bank PSG
	4. Union National Bank
	5. Commercial Bank of Dubai PSC
Bahrain	1. Ahli United Bank BSC
	2. Arab Banking Corporation
	3. BBK BSC
Kuwait	1. National Bank of Kuwait
	2. Ahli United Bank KSC
Qatar	1. Qatar National Bank
	2. The Commercial Bank
	3. Doha Bank

	4. Alkhalij Commercial Bank
	5. Ahli Bank
Saudi Arabia	1. Riyad Bank
	2. Samba Financial Group
	3. Saudi British Bank
	4. Banque Saudi Fransi
	5. Arab National Bank
	6. Saudi Investment Bank
Oman	1. Bank Muscat SAOG
	2. National Bank of Oman
	3. HSBC Bank Oman
	4. Oman Arab Bank

Source: By the author

In total, there are 25 banks from 6 GCC countries. The choice of sample banks is according to the following reasons:

- ✓ Lack of previous studies focusing on banks from emerging countries;
- ✓ The problems in the GCC countries such as oil fluctuations;
- ✓ The fragility of their financial system.

For more details of the countries of our sample we describe the financial and banking sectors of these countries in addition to their derivatives markets.

I.1.1.2.A. An overview on GCC financial sector

The Gulf Cooperation Council was established in an agreement concluded on 25 May 1981 in Riyadh, Saudi Arabia between six countries namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE. The economies of these countries are large oil exporters with fixed exchange rate regimes. Hence, they are exposed to international oil prices fluctuations. Moreover, their financial systems are dominated by the banking sector. In the crisis of 2008, the banking sector in the GCC countries was buttressed by high profits and capital buffers. However, the crisis had a negative effect on the GCC countries such as reliance on external financing and high exposures to the real estate and construction sector and equity prices.

According to **(Khamis, Al-Hassan, & Oulidi, 2010, p 5-8)** the financial sector in GCC is dominated by the banking sector where the banking sector is largely domestically owned. Oman and Saudi Arabia have a relatively high public sector ownership, while almost half of the domestic sector's assets of the banking sector in UAE are owned by the public sector. Hence, the UAE and Bahrain have important foreign bank presence in the banking sector, and Bahrain and Oman have sizeable joint ventures in the domestic banking system with foreign investors, mostly from the GCC. As for Saudi Arabia, the joint ventures in the domestic banking sector are small and by non-GCC investors, while in UAE and Kuwait they are negligible. Moreover, except for Bahrain all GCC countries have limits on foreign ownership due to the entry barriers and licensing restrictions for foreign banks. Thereby, the cross-border presence of GCC banks and other foreign banks is limited and it is usually in the form of branches.

In addition, public and quasi public-sector ownership varies but rangers from 13 percent in Kuwait to 30 percent and 35 percent in Oman and Saudi Arabia respectively, while in UAE it reaches to 52 percent. Thus, in UAE public ownership of domestic banks is owned by the government while in Oman and Saudi Arabia's relatively high public-sector ownership is mostly attributed to quasi government ownership. In addition, **(Molyneux & Iqbal, 2005,p145)** deduced that the commercial banks are dominated in Gulf systems and these are highly concentrated.

Furthermore, the GCC banking sector is heavily concentrated with few banks dominating the market where Bahrain, Kuwait and Qatar are the most concentrated banking systems.

As for Nonbank financial institutions (NBFIs) in the GCC, they are limited, while Investment funds have been growing rapidly in several countries they are almost 95 investment companies in Kuwait while in Bahrain, Saudi Arabia and the UAE they are limited **(Calice & Mohamed, 2015, p6)**. However, the baking sectors in the GCC countries are well capitalized across the board with capital adequacy ratio and well leverage ratios by international comparisons although they faced a rapid credit growth and increasing leverage recently. **(Khamis et al., 2010, p 19)**

I.1.1.2.B. An overview on GCC banking sector

Banks in the GCC region generally hold high levels of capital, and their economies dependent on oil as a key driver of growth, consequently GCC banks' net income is highly correlated with oil-driven fiscal developments and this implies that the oil price is a significant risk factor driving credit default. (**GCC annual meeting of finance and central bank governors, 2014, p.4**)

The banking sector in GCC has some characteristics: **(Kern, 2012, p13-14)**

- ✓ **High industry concentration**

The small number of banking institutions are the dominants in the national banking markets, with concentration ratios for the top 5 banks ranging from 47% to 81% banking in the UAE and Bahrain are less concentrated below 50%. The highest level of concentration ratios are in Saudi, Kuwait, Oman and Qatar where it equals to 66%. The top 3 banks control the two-third of the banking assets.

- ✓ **Strong public and domestic ownership**

In GCC countries, domestic investors' control the banking institutions except in Oman and Bahrain are the most open banking markets, where foreign investors hold between 30% and 40% of domestic banking assets. Hence, governments' investment vehicles and royal families play a major role as investors and owners of banking institutions. With the UAE have more than half of all banking assets (public owned), Oman and Saudi Arabia as intermediate cases, while Bahrain, Kuwait and Qatar with lesser public participation.

- ✓ **Weak competition**

A low competition in GCC banking institutions have been reflected in high price levels of financial products, a limited variety of products and services offered by banks, low level of quality in services due to the concentration and ownership structures. As for foreign banks, they have succeeded in UAE, Bahrain and Oman.

- ✓ **Favorable funding conditions**

Due to public ownership, a favorable funding condition for banks is caused where government backed cheap refinancing in order to the growth of banks and the extreme expansion of credit in the past decade. Additionally, the competitive implications of this funding advantage for incumbent banks are evident and implicit subsidization of domestic banks may cause a misallocation of capital in the domestic economy.

- ✓ **Concentration risks in lending**

Due to the growth in bank lending, a rise in level of risk has become obvious where the high share of credit handed out to the real estate and construction sectors between 20% and 50% of total credit in UAE, Kuwait and Bahrain has caused concentration risks to the notional banks markets. In addition, lending to households present a strong share of the credit business between 20% and 40% in Bahrain, Oman, Saudi and UAE, while credit to the public sector is lower due to the increase in oil revenues and the reduction in public project spending after crisis started.

- ✓ **Changing economic environment**

GCC government have worked hardly to provide monetary and fiscal stimulus in order to develop their financial sector where the development of state-sponsored enterprises, government sponsored development projects, but also of the diversification strategies, the promotion of private business and the evolution of personal incomes strongly influences the demand for credit, asset management and other banking services.

- ✓ **Evolving business strategies**

During the crisis, GCC banks have succeed to maintain a secured level of liquidity and profitability in addition to the improvement of the quality of their credit and asset portfolio. In addition, the Basel II and III regulatory requirements changes to capital and liquidity requirements and sharpened prudential requirements on risk management leading to a raise the cost pressure on the banking sector. Hence, the banks are facing hardly to maintain the past levels of profitability without reforms to their business strategies.

As pointed by **(Khamis et al., 2010, p 6)** the structure of the financial sector in the individual GCC countries included in our sample is characterized as follow.

- ✓ **Bahrain.** The banking sector in Bahrain is the largest in the region and it is the least concentrated among the GCC systems as well as the UAE banking sector **(Khamis et al., 2010, p 6)**.There are 25 retail banks' total assets increased from 95$ billion in

2017 to 96 $ billion in 2018 **(KPMG, 2019, p6)**. The three largest retail banks are (Bank of Bahrain and Kuwait, National Bank of Bahrain, and Ahli United Bank). Bahrain has a vibrant wholesale banking sector the largest of which is Arab Bank Corporation which provides off-shore, investment banking, and project finance services to the rest of the region. The financial sector contributes about one-third of the country's GDP and employs around 3 percent of its workforce. As a result of its linkages with global financial markets, the banking sector has been strongly affected by the global crisis. Additionally to the banking sector, Bahrain is home to a number of investment funds with assets under management close to 80 percent of GDP **(Khamis et al., 2010, p 6)**. In addition, the financial performance of banks was overall increasing where Return on Equity was in the range of 0.6 – 17.1 percent. **(KPMG, 2019, p6)**. In 2018, Bahrain banking sector witnessed an increase in assets with a growth in the loan portfolio of retail banks, where the total outstanding retail loans in 2018 was 24.9 $ billion which represent 9.2 percent year-on-year growth. The majority of banks achieved a growth of 2.2 – 14.7 percent excluding two banks that have a decrease in their performance. Moreover, Capital Adequacy ratio ranges from 13.4 -33.8 percent compared to the minimum requirements of 125 percent. Although, banks achieved a level above the minimum of Capital Adequacy ratio individually, the overall movement showed a decreasing trend of 0.9 percent. However, the profitability was higher for majority of the banks compared to 2017. In addition, banks succeeded to keep their costs under control. In 1 January 2018, all banks adopted IFRS 9 except for two banks they have adopted in previous years. Furthermore, the Asset Quality averages 8.7 to 12.0 percent of total loans, while Non-Performing loans remained controlled because of the application of transition provisions allowed after IFRS 9 was adopted **(KPMG, 2019, p7)**. However, the retail banking portfolio in Bahrain is highly exposed to construction and real estate and the household sectors although the household loans are secured by salary. **(Khamis et al., 2010, p 17)**

- ✓ **Kuwait.** According to **(Khamis et al., 2010, p 6)** the banking sector is highly concentrated with the two largest banks (National Bank of Kuwait and Kuwait Finance House) accounting for half of the banks' total assets. In addition, there are 95 investment companies. This sector has been strongly affected by tight global liquidity conditions and falling asset prices. In Kuwait, total listed banking sector assets at the end of 2018 stood at 264.5 $ billion which represent 5.0 percent higher than 2017. In addition, due to the increase in net interest income by 11.0 percent in local currency, profits in Kuwait banks have increased by 19.3 percent comparing to 2017, where all banks witnessed a growth of 19.3 percent in net profit comparing to 2017 and cost to income ratio average was equal to 37.9 percent. As for non-performing loans it was less than 2.0 percent and this percent was the lowest among all GCC banks **(KPMG, 2019, p15-16)**. However, the banking portfolio is highly exposed to the real estate and construction sectors. Additionally, household loans and nonbank financial institutions are important in bank's loans portfolios accounting. Consequently, banks from Kuwait are highly exposed to market induced credit risk in addition to their expose to Kuwait's troubled investment companies. **(Khamis et al., 2010, p 17)**

- ✓ **Oman.** The banking system in Oman is considered the smallest in the GCC region. Consequently, foreign banks finance some of the largest government projects. The banking sector is high concentrated with the largest two banks bank Muscat and the National Bank of Oman **(Khamis et al., 2010, p 6)**. Total assets of the banking sector have increased by 7.3 percent from 71.0 $ billion in 2017 to 76.2 $ billion in 2018. Muscat bank represented 42.0 percent of total listed banking assets at the end of 2018. The growth in average interest rates and growth in loans and advances have led to an increase in Profitability by 11.5 percent. Although, the increase in cost of funds due to a combination of higher US interest rates and competition for deposits, total credit increase by 6.3 percent in 2018. Return on asset increased by 0.2 percent and return on equity increased to 8.4 percent in 2018. Overall, cost to income ratio improved because of an increase in income which outstripped an increase in costs. Additionally, the average deposit rates increased from 1.7 percent to 1.9 percent while the average of lending rates increased from 5.2 percent to 5.3 percent. Moreover, the level of liquidity excess 100.0 percent which is cause of concern and illustrate a tighter liquidity levels. As for regulatory of capital, it continues to increase as Basel III regulations are gradually implemented. **(KPMG, 2019, p23-24)** The banking sector in Oman is exposed to the household sector mostly. Because of Omani households are highly leveraged with household loans, rising consumer indebtedness is increasing. Furthermore, a high proportion of the corporate loan portfolio is in a handful of large exposures causing important risks to the banking sector. **(Khamis et al., 2010, p 18)**

- ✓ **Qatar.** The third largest after Bahrain and the U.A.E. is the Qatari banking sector; it is highly concentrated with the three largest local banks (Qatar National Bank, Commercial Bank of Qatar, and Doha Bank). The competition in the banking sector in Qatar is increased due to the entry of foreign banks under the Qatar financial Center despite the fact that the local banks have well-established franchises in domestic business. As for foreign banks, they are mainly engaged in financing large infrastructure projects and investment banking. Additionally, there are three specialized government-owned banks operating mostly in development and housing projects, also six finance and leasing companies. The banking sector is mostly concentrated in the household, construction and real estate, and government sectors **(Khamis et al., 2010, p 6)**. The amount of total assets of listed banks increased by 3.2 percent, where in 2018 it was equal to 408.4 $ billion due to an increase in cash and cash equivalents and higher financing asset balances. The market is dominated by Qatar national bank, which had a market share of 58.0 percent of total listed banking assets in 2018. Moreover, the average of banks' profitability has grown by 9.5 percent because of the higher levels of net interest income and a decrease in costs. Comparing to GCC banks, Qatar banks have the lowest cost to income ratio. As for the expected credit losses in Qatar bank, it was equal to 3.0 $ billion on the adoption of IFRS 9. It witnessed an increase of 50% comparing to 2017. The average of CAR increased by 0.5 percent, where the regulatory capital adequacy requirements have been and continue to increase with the gradual phasing of Basel III regulations **(KPMG, 2019, p32-33).** Qatari banks are mostly concentrated in the household, construction and real estate, and government sectors. An important share of these loans might be for securities investments. As a result, this could be a potential risk due to risk concentration and the difficulty arising from monitoring margin lending. **(Khamis et al., 2010, p 18)**

- ✓ **Saudi Arabia. (Khamis et al., 2010, p 6)** deduce that the banking sector is concentrated with the three largest banks (National Commercial Bank, Samba Financial Group, Al Rajhi Bank). Hence, it is considered relatively small. Public ownership is fairly extensive in four banks and reaches 80 percent in the largest bank, the National Commercial Bank. In addition, there are five credit institutions with asset size close to half that of the banking sector and three autonomous government institutions that dominate the primary market for government securities, while the rest of the nonbank financial institutions account for a marginal share of the total financial system's assets. The total assets of the listed banking sector increased only a growth of 2.1 percent, which is consistent with the GDP growth in 2018. Driven by higher the Saudi Arabian Interbank Offered rates (SAIBOR) in 2018, the profitability increased by 11.3 percent in 2018, Net profit increased by 11.3 percent, cost to income ratio improved by 0.3 percent and CAR by 0.3 percent as well with the implementation of IFRS9. During 2018, the increase in SAIBOR rates was in line with rate-setting trends by the US Federal Reserve and had a positive effect on bank margins with the stability in funding costs **(KPMG, 2019, p41-42)**. In Saudi Arabia, the loan portfolio is well diversified with respect to the corporate sector with trade being the main sector. As for household loans, they are also well diversified with no dominating sub-sector. However, some margin lending for equities could be a source of risk similarly to the rest of GCC countries. According to **(Khamis et al., 2010, p 18)** prudential regulations in Saudi Arabia curb credit growth risks by requiring banks to obtain Saudi Arabia Monetary Authority's approval for foreign lending and by imposing statutory caps on individual indebtedness.

- ✓ **U.A.E**. According to **(Khamis et al., 2010, p 6)** the banking sector in the UAE is the second largest banking sector in the GCC after Bahrain and it is the least concentrated. The three largest banks are (National Bank of Abu Dhabi, Emirates Bank International, and Abu Dhabi Commercial Bank). As for the ownership of banks it is still predominantly held by the government. In addition, the financial sector of the UAE also includes two important Islamic mortgage finance companies. The banking sector is highly exposed to the construction sector and the highly speculative real estate sector. Overall, Gross assets increased by 7.9 percent, Capital Adequacy ratio decreased from 18.7 percent to 17.3 percent due to the adoption of Basel III and IFRS9. As for liquidity it seems steady. Moreover, non-performing loans ratio decrease to 3.1 percent due to the several banks writing off bad book loans. Return on equity and cost to income ratio increase to 37.5 percent due to overall growth in business and a decrease in net impairment charges. The banking sector ended 2018 with stable results with a focus on tight underwriting standards for credit initiation to manage provisions and to improve efficiencies within an operating model to reduce cost. Furthermore, profitability increased by 11.1 percent due to the decline in impairment charge of 10.7 percent in addition to the efforts to manage operating cost **(KPMG, 2019, p50-51)**. Banks in UAE are highly exposed to the construction sector and the highly speculative real estate sector and to the household sector. The banking portfolio is concentrated in the corporate sector accounting around two-thirds of total loans. Moreover, financing is directed mostly to large private business groups or government owned related enterprises and due to large financings of a few family-owned business and government-related entities, there is a high level of concentration of credit risk. **(Khamis et al., 2010, p 18-19)**

I.1.1.2.C. Derivatives markets in GCC

Although the desire in change of GCC in order to develop their financial markets, the past few years of financial turmoil lead to some obstacles such as low market liquidity, large price swings, funding issues in prominent state-owned enterprises have made the financial development more difficult. However, the GCC financial markets remain small and behind their potential. **(Kern, 2012, p1)**

Before the financial crisis, the financial markets of GCC have emerged stable from the financial crisis although they were touched by the event in Europe and America. After the crisis, the financial market of Oman has fallen by one-fifth, Bahrain, Kuwait and Abu Dhabi around one-third and Dubai around two-third, while Saudi Arabia has fallen almost 50 percent and a price collapse of the key financial assets especially in Emirates. Consequently, GCC financial markets have not regained the dynamism they have before the crisis although political actions and business recovery. **(Kern, 2012, p4)**

Driven by solid demand, technological progress and regulatory liberalization, the financial in GCC is small comparing to the international financial markets. The GCC financial markets have 0.8% share in global financial markets with 1.7% share in worldwide GDP. **(Kern, 2012, p9)**

However, the GCC have been exposed to the risks of the EU and US debt crises like the global economy as whole especially as the global demand greatly influences their hydrocarbon sales. In addition, the struggle for democracy and liberty in some MENA region such as Egypt, Tunisia, Libya, Syria and public discontent in parts of the Gulf region, the financial markets have been affected due to the political uncertainty. **(Kern, 2012, p4-8)**

According to **(Kern, 2012, p19)** derivatives markets in GCC are not developed due to regulatory limitations on these products. Hence, the majority of GCC countries have not handed out licenses for the necessary product registration, trading and clearing infrastructure. Additionally, the Islamic banks are not in a position to trade in derivative instruments. Although, the complexity of these financial instruments and the great caution in their use by policymakers, regulators and even market participants, the prudent development of derivative instruments in GCC markets may bring benefits in terms of greater liquidity and underlying markets, better risk management for investors and wider scope for diversification.

In Kuwait, the government and markets have established a market for options and futures on equities by providing derivative contracts on a number of individual stocks. In UAE, the Dubai Multi Commodities Center offers commodity derivatives, while in Abu

Dhabi a range of exchange traded funds has been listed. In Bahrain, financial exchanged trade of derivatives and structured products. In Qatar, a market for energy derivatives has been established. Thus, the progress on the derivatives front remains isolated.

I.1.1.3. Methodology

Firstly we represent the used variables in the first model with their definitions then we will test our first hypothesis and the expected results comparing to the literature results.

I.1.1.3.A. Variables description

The used variables in this analysis are described in the table (3.2).

Table (3.2): Variables definition

Variables	Proxy	Definition	References
Dependent variable			
Stock Return	Financial performance	As defined in equation 1	Keffala (2012)
Independent variables			
Derivatives	Derivatives	The notional value of derivatives divided by total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Size	Bank size	Natural log of total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
NIM	Net interest margin	The difference between total interest income and total interest expense expressed as a percentage of total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Liquidity	Liquidity	The ratio of liquid assets equity to total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Credit risk	Credit risk	The ratio of loan loss-reserves to gross loans.	Chaudhry et al (2000); Reichert and Shyu (2003).

Source: by the author depending on literature review

From the table (3.2), the dependent variable is defined as stock return of each bank and it is used as proxy for their financial performance. However, the independent variables were as follow: derivative instruments, bank size, net interest margin, liquidity and credit risk. The choice of these variables is according to previous studies and literature.

I.1.1.3.B. Testing hypotheses and expected results

According to literature (Rivas et al., 2011); (Said, 2011); (Shen & Hartarska, 2018) and (Mohamed Keffala, 2019) the derivative instruments use tend to increase the bank performance. Hence, our first hypothesis stipulates that the effect of derivative instruments use is positive on performance of banks.

For the variable bank size according to literature and the theory it is known that large banks are well-diversified. Hence, the chance of their fail is less comparing to small banks. Consequently, a positive relation between bank performance and bank size is predicted (Rivas et al 2006; Reichert and Shyu 2002; Keffala 2012). Moreover, in the study of (Said 2011) net interest margin have a positive effect on bank performance. Furthermore, according to literature (Keffala 2012) liquid assets in portfolios refer to the fact that banks are healthy, so we conduct a positive relationship between the variable liquidity and bank performance.

Lastly, the variable credit risk is expected to have a negative effect on performance of banks (Keffala 2012).

The table (3.3) summarizes the predicted effect of the independent variables and their references.

Table (3.3): The predicted relationship between dependent variable and independent variables

Variables	Expected sign	References
Derivatives	+	Rivas et al (2006), said (2011), Keffala (2012)
Size	+	Rivas et al (2006); Reichert and Shyu (2002)
Net interest margin	+	Said (2011)
Liquidity	+	Keffala (2012)
Credit risk	-	Keffala (2012)

Source: by the author depending on literature review results

I.1.2. Empirical analysis

The empirical model is represented followed by unit root test results and descriptive statistics.

I.1.2.1. Empirical model

The equation below represents the conceptual model of the first part of this section which describes the effect of derivatives on financial performance of banks measured by stock returns of each bank individually.

First model:

$$Stock\ return_{i,t} = \alpha_0 + \alpha_1 Derivatives_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 NIM_{i,t} + \alpha_4 Liquidity_{i,t} + \alpha_5 Credit\ risk_{i,t} + \varepsilon_{it}$$

Where:

ε_{it}: is the random error.

The other variables are defined previously.

I.1.2.2. Unit root test

As seen below, the stationarity of the variables is checked using several tests. Trying with individual intercept, then individual intercept and trend and finally without individual intercept and trend. The results are as follow:

Table (3.4): Stationarity test results

Variables	LLC	IPS	ADF	PP	Decision
Stock return	-11.1834 (0.0000)	-5.1670 (0.0000)	119.560 (0.0000)	123.989 (0.0000)	Stationary at level
Derivatives	-63.0980 (0.0000)	-12.1034 (0.0000)	82.7248 (0.0025)	78.7588 (0.0058)	Stationary at level
Size	-37.6437 (0.0000)	-15.4769 (0.0000)	99.9018 (0.0000)	115.241 (0.0000)	Stationary at level
NIM	-7.72826 (0.0000)	-6.03045 (0.0000)	66.0119 (0.0641)	53.0076 (0.0358)	Stationary at level
Liquidity	-3.03821 (0.0012)	-3.33152 (0.0004)	89.4603 (0.003)	109.291 (0.0000)	Stationary at level
Credit risk	-8.49817 (0.0000)	-3.90960 (0.0000)	94.4634 (0.0001)	71.5909 (0.0242)	Stationary at level

Source: by the author depending on Eviews 9 results

According to the table (3.4) results, the stationarity of all variables is checked since the P value of the majority of tests is closed to 0, which means we reject the null hypothesis of Unit Root at 5 % significance level.

1.1.Descriptive statistics

The table (3.5) describes the statistical variables used in the model divided according to our sample countries.

Table (3.5): Panel A. descriptive statistics of variables from UAE

UAE

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0085	0,0069	0,0276	0,0001	0,0085	0,7768	2,3887	3,4843
SIZE	5,0697	4,9894	5,6091	4,5825	0,3123	0,1107	1,9212	1,5160
NIM	3,3457	3,1800	4,4400	2,4000	0,5527	0,6431	2,3553	2,5876
LIQUIDITY	0,1651	0,1435	0,3268	0,0805	0,0654	1,1621	3,3801	6,9333
CREDIT_RISK	5,5157	5,0950	8,7100	2,0500	1,7830	0,1954	2,0894	1,2275
STOCK_RETURN	-0,0541	0,0235	0,5671	-2,9723	0,5972	-4,0800	20,4779	465,0809

Source: by the author depending on Eviews 9 results

In UAE all variables are normally distributed except for liquidity and stock return according to Jarque-Bera probability, while Skewness has an average of 0.57 ranging from -4.08 to 1.16 and Kurtosis has an average of 5.43 also ranging from 1.92 to 20.47. For the variable derivatives ‘average is 0.0085 with a maximum of 0.02 and standard deviation of 0.0085. In addition, the variable size has a maximum of 5.60 and standard deviation of 0.31 with an average of 5.06; while the net interest margin has a maximum of 4.44 and a standard deviation of 0.55. Moreover, the variable liquidity has an average of 0.16 and maximum value of 0.32 with a standard deviation of 0.06. Furthermore, the variable credit risk has a standard deviation of 1.78 and maximum value of 8.71. Finally, the variable stock return has a maximum of 0.56 and standard deviation of 0.59.

Table (3.6): Panel B. descriptive statistics of variables from Bahrain

Bahrain

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0046	0,0034	0,0211	0,0002	0,0046	1,7711	6,5997	32,9433
SIZE	4,2495	4,3939	6,5755	3,2289	0,7736	1,3594	5,9007	21,0746
NIM	2,2597	2,3450	3,1300	1,1300	0,5148	-0,3775	2,4019	1,2371
LIQUIDITY	0,1898	0,1928	0,3454	0,0000	0,0742	-0,6783	3,8828	3,4932
CREDIT_RISK	3,9457	3,9050	6,9000	1,3900	1,2763	0,2143	3,3176	0,3557
STOCK_RETURN	-0,1277	-0,0153	2,2743	-1,9870	0,7847	-0,0706	6,2175	11,6688

Source: by the author depending on Eviews 9 results

In Bahrain, the results shows that the variables are normally distributed according to Jarque-Bera probability while Skewness ranges from -0.67 to 1.77 and Kurtosis had an average of 4.72. Derivatives in Bahrain have an average of 0.0046 with a maximum value of 0.0211 and a standard deviation of 0.0046. For the variable size it has an average of 4.24 and standard deviation of 0.77 while maximum value is equal to 6.57. In addition, net interest margin had an average of 3.13 and a standard deviation of 0.51. Moreover, the maximum value of liquidity is equal to 0.18 while its standard deviation is 0.07. However, the variable credit risk has a maximum value of 6.90 and a standard deviation of 1.27. Additionally, stock return has a standard deviation of 0.78 and a maximum of 2.27.

Table(3.7): Panel C. descriptive statistics of variables from Kuwait

Kuwait

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0003	0,0002	0,0008	0,0000	0,0003	0,2922	1,3065	1,4711
SIZE	3,8373	3,5915	4,3729	3,3899	0,4194	0,1863	1,1817	1,5790
NIM	3,1109	3,1000	3,5300	2,8400	0,2508	0,6229	2,0062	1,1641
LIQUIDITY	0,2390	0,2410	0,3338	0,1555	0,0541	0,0385	2,1335	0,3468
CREDIT_RISK	3,9200	3,9100	4,3500	3,3000	0,3740	-0,3476	1,7586	0,9278
STOCK_RETURN	0,0139	-0,0117	0,1776	-0,0587	0,0677	1,3962	4,1310	4,1601

Source: by the author depending on Eviews 9 results

In Kuwait all variables are normally distributed according to Jarque-Bera results and Skewness ranges from -0.34 to 1.39 while Kurtosis ranges from 1.18 to 4.13. The average of derivatives is 0.003 with a maximum of 0.008 and standard deviation of 0.003. For the variable size the maximum value is 4.37 while the standard deviation is equal to 0.41 with an average of 3.83. In addition, the variable net interest margin has a maximum value of 3.53 and a standard deviation of 0.25; while liquidity had an average of 0.23 and standard deviation of 0.05. Moreover, credit risk has a maximum of 4.35 with a standard deviation of 0.37. The variable stock return has a maximum of 0.17 and a standard deviation of 0.06.

Table (3.8): Panel D. descriptive statistics of variables from Qatar

Qatar

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0017	0,0006	0,0098	0,0000	0,0022	2,0455	7,1962	41,5007

SIZE	4,8713	4,7960	5,7313	4,2534	0,4335	0,5973	2,4120	2,1420
NIM	2,8366	2,9200	3,8000	1,7000	0,5386	-0,7449	2,9181	2,6901
LIQUIDITY	0,1360	0,1374	0,2668	0,0559	0,0498	0,6349	3,3913	2,1330
CREDIT_RISK	2,1110	2,0100	3,6400	0,6600	0,8383	0,1711	2,0279	1,2834
STOCK_RETURN	0,0221	-0,0024	0,3213	-0,2096	0,1113	0,4641	3,3676	1,2042

Source: by the author depending on Eviews 9 results

According to Jarque-Bera all variables are normally distributed except for derivatives in Qatar. As for Skewness it is ranging from -0.74 to 2.04 and Kurtosis is also ranging from 2.02 to 7.19. Concerning the variable derivatives in Qatar it has an average of 0.0017 with a maximum of 0.0098 and a standard deviation of 0.0022; while the variable size standard deviation is equal to 0.43 with a maximum of 5.7 and an average of 4.87. Moreover, net interest margin has a standard deviation equals to 0.53 and a maximum of 3.80. Furthermore, liquidity maximum value is equal to 0.26 and a standard deviation of 0.04 while average is equal to 0.13; credit risk has a maximum of 3.64 and a standard deviation of 0.83 while stock return standard deviation is 0.11 and a maximum of 0.32.

Table (3.9): Panel E. descriptive statistics of variables from Saudi Arabia

Saudi Arabia

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0113	0,0118	0,0345	0,0009	0,0097	0,7439	2,6133	3,5443
SIZE	5,1664	5,2311	5,3715	4,7117	0,1732	-1,3287	4,0145	12,1370
NIM	2,5967	2,5950	3,0500	1,9300	0,2522	-0,6369	3,5405	2,8720
LIQUIDITY	0,1123	0,1002	0,2200	0,0587	0,0361	0,8010	3,3623	4,0464
CREDIT_RISK	2,4769	2,1100	7,6500	1,3000	1,3073	2,3649	9,0555	88,5601
STOCK_RETURN	0,0038	-0,0025	0,1793	-0,1769	0,0786	-0,1174	2,8463	0,1181

Source: by the author depending on Eviews 9 results

For Saudi Arabia results the variables are normally distributed according to Jarque-Bera except for size and credit risk. Skewness has ranged from -1.13 to 2.36 and Kurtosis has ranged also from 2.61 to 9.05. The average of derivatives in Saudi Arabia banks is equal to 0.0113 with a maximum of 0.0345 and a standard deviation of 0.0097; for size the average is 5.16 with a standard deviation of 0.17 and a maximum of 5.37. In addition, the maximum value of net interest margin is 3.05 with a standard deviation of 0.25; while liquidity standard deviation is 0.03 and maximum of 0.22 with an average of 0.11. Moreover, credit risk maximum value is 7.65 with a standard deviation of 1.30; lastly stock return maximum is 0.17 with a standard deviation of 0.07.

Table (3.10): Panel F. descriptive statistics of variables from Oman

Oman

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0020	0,0017	0,0067	0,0000	0,0019	0,8872	3,0068	2,4927
SIZE	3,5084	3,4045	4,0985	2,9868	0,3199	0,4095	2,0376	1,2643
NIM	3,1374	3,2100	3,9100	2,3500	0,4676	-0,0981	1,9581	0,8898
LIQUIDITY	0,1828	0,1708	0,2754	0,1262	0,0431	0,5930	2,3237	1,4757
CREDIT_RISK	3,4642	3,4200	4,7400	2,2800	0,6486	0,3406	2,3589	0,6928

STOCK_RETURN	-0,0211	-0,0184	0,1636	-0,1683	0,0763	0,1933	3,4315	0,2657

Source: by the author depending on Eviews 9 results

Oman results show that all variables were normally distributed according to Jarque-Bera and Skewness ranges from -0.09 to 0.88 while Kurtosis ranges from 1.95 to 3.43.
For the variable derivatives maximum value is 0.0067 with an average of 0.0020 and a standard deviation of 0.0019. Concerning the variable size' average is 3.50 with a maximum of 4.09 and a standard deviation of 0.31. Additionally, net interest margin maximum value is 3.91 and a standard deviation of 0.46. For liquidity the average is equal to 0.18 with a standard deviation of 0.04 and a maximum value of 0.27. In addition, credit risk maximum value is 4.74 with a standard deviation of 0.64. Lastly, stock return standard deviation is 0.07 with a maximum value of 0.16.

To summarize, UAE banks are the most users of derivative instruments in GCC countries with a standard deviation of 0.0085. Moreover, the Saudi Arabian banks are the larger banks while the smallest banks are Kuwait banks. For net interest margin the highest scores are in UAE banks followed by Oman, Qatar, Kuwait, Bahrain and lastly Saudi Arabia where the standard deviation in UAE is the highest with a score of 0.5527 and the lowest standard deviation is in Kuwait. Furthermore, the high liquidity levels is in Kuwait banks followed by Oman, Bahrain, UAE, Qatar and lastly Saudi Arabia, for the standard deviation which is a measure of risk the highest level is in Bahrain and the lowest in Saudi Arabia. In addition, UAE banks have the highest level of credit risk followed by Saudi Arabia, Bahrain, Oman, Kuwait and lastly Qatar, while the standard deviation high level is in UAE and the lowest is in Kuwait. Finally, the highest level of stock return is in Bahrain followed by UAE, Qatar, Saudi Arabia, Kuwait and lastly Oman with Bahrain as it has the highest level of standard deviation and Kuwait as it has the lowest level of Standard deviation.

After presenting variables description for the first model, we regressed the variables in order to estimate the relationship between stock returns and derivatives. This step is defined in details in the next part.

I.1.3. Regression analysis

I.1.3.1. Static Panel analysis

In the table (3.11), the estimation results of the first model are summarized.

Table (3.11): Estimation outputs of the first model

Independent Variable	Method of estimation			
	PLS	FEM	DFE	REM
C	-0.040541 (-0.108755)^{ns}	-6.469987 (-2.098116)**	-3.978107 (-0.8559314)^{ns}	-0.040541 (-0.106976)^{ns}
Derivatives	-3.237938 (-0.622870)^{ns}	-2.822016 (-0.255561)^{ns}	1.113400 (0.097635)^{ns}	-3.237938 (-0.612679)^{ns}
Size	-0.034234 (-0.552597)^{ns}	1.053731 (-1.789743)*	6.509114 (0.534943)^{ns}	-0.034234 (-0.543556)^{ns}
NIM	0.171412 (2.339601)**	0.501579 (3.004785)***	0.473541 (2.805829)***	0.171412 (2.301323)**
Liquidity	-1.592426	1.304616	2.033172	-1.592426

	(-2.394744)***	(1.010034)^{ns}	(1.470789)^{ns}	(-2.355563)**
Credit risk	-0.013786 (-0.596091)^{ns}	-0.020648 (-0.453936)^{ns}	-0.027595 (-0.610587)^{ns}	-0.013786 (-0.586338)^{ns}
Log likelihood	-76.13551	-64.69291	-59.67623	-
S.E	0.422660	0.429690	0.424355	0.422660
R^2	0.084832	0.221052	0.274191	0.084832
F statistic	2.521313**	1.095988^{ns}	1.188873^{ns}	2.521313**
DW	2.129498	2.32661	2.331994	2.129498
No of Obs	142	142	142	142
Hausman test				
Dependent variable Stock return	**Chi 2 (5)**		**Prob < Chi 2**	
	11.138025		0.0487	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

Firstly, the PLS model is accepted statistically at level of significance equal to 5% according the fisher statistic and R square equal to 8% meaning that the independent variable explaine only 8% of the dependent variable and the coefficients indicate that Derivatives, size and credit risk affect negatively stock return but they are not significant. While, NIM is correlated positively with stock return at level of significance equal to 5%, which revealed that the accounting performance of banks presented in the indicator NIM increases stock return of banks in financial markets. However, liquidity have a negative effect on stock return which indicates that banks' level of liquidity increases liquidity risk ok the banks leading to a decrease in the financial performance of the banks by affecting negatively their stocks returns. **(See appendix 1)**

Secondly, the fixed effect model is rejected statistically at level of significance equal to 5% according to fisher statistic, and the independent variables explain only 22% of dependent variable as stated by R square. About the independent variables coefficients signs the effect of derivatives remains the same like the previous model and still insignificant, while the variables size becomes positive and significant at level of significance equals to 10%. This result shows that when adding fixed effect to the model the size of banks affect positively their stock's returns which means that the larger banks become the more return they make in stock markets. For the variable NIM a positive effect is detected on the stock return at level of significance equals to 1%. Moreover, both liquidity and credit risk are not significant. **(See appendix 2)**

Like the previous models, the DFE model was also rejected statistically at level of significance equal to 5% and R square was equal to 27%, and the independents variables signs did not change comparing to the previous model except for the variable derivatives but they were statistically not significant except for the variable NIM which were significant at 1%. **(See appendix 3)**

Finally, despite of the decrease in R square to 8%, the random effect model was accepted statistically at level of significance equal to 5%. The coefficients of the independent variables did not change comparing to PLS model, where only two variables NIM and liquidity are significant at level of significance equals to 5%. **(See appendix 4)**

From Hausman test, Chi square equals to 11.13 for the dependent variable stock return indicating that the studied variables have a fixed effect, as the probability is less than 5% we reject the null hypothesis which says that the random effects models are the appropriate models and accept the alternative hypothesis. Hence, the fixed effects models are the appropriate model. **(See appendix 5)**

I.1.3.2. Specification tests results

I.1.3.2.A. Matrix of correlation

The correlations between variables of the first model are presented in the following matrix:

Table (3.12): Matrix of correlations (Stock return is the dependent variable)

	Derivatives	Size	NIM	Liquidity	Credit risk	Constant
Derivatives	1.0000					
Size	-0.4245	1.0000				
NIM	0.2182	-0.0594	1.0000			
Liquidity	-0.1169	0.4120	-0.0795	1.0000		
Credit risk	-0.0679	0.0131	-0.3534	-0.2710	1.0000	
Constant	0.1679	-0.8198	-0.4395	-0.4838	0.0528	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.13): Multicollinearity test results of the first model

	VIF	1/VIF
Size	1.49	0.669232
Liquidity	1.39	0.720799
CreditR	1.30	0.768054
Derivatives	1.29	0.775508
NIM	1.25	0.801815
Mean VIF	1.34	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the coefficients are less than 5.

I.1.3.2.B. Heteroskedasticity test

From the table (3.14), the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it was less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 6)**

Table (3.14): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P –value
Stock return	255.27	0.0000

Source: by the author according to Stata16 results

Additionally, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.15): White test results for Heteroskedasticity

Dependent variable	Chi 2(20)	P –value
Stock return	36.09	0.0150

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 7)**

I.1.3.2.C. Endogeneity test

The following table shows the results of the first model endogeneity test.

Table (3.16): Endogeneity test results (Stock return as the dependent variable)

Instruments		Chi-sq (1)	P-value
Included	Size, liquidity, credit risk.	8.728	0.0031
Excluded	NIM		
Included	Size, NIM, credit risk.	1.056	0.3041
Excluded	Liquidity		
Included	Size, Liquidity, NIM	0.215	0.6430
Excluded	Credit risk		
Included	NIM, liquidity , credit risk	3.253	0.0713
Excluded	Size		

Source: by the author according to Stata 16 results

According to the results of the table (3.16), the p-value of the majority estimated regressions is higher than 5% which means that there is an endogeneity problem in our first model. **(For more details see appendix 8)**

Because of the existence of heteroskedasticity and endogeneity problem in addition the number of banks (groups) is greater than the number of the time period we can apply the dynamic panel system of the Generalized Method of Moments estimator which is considered the most appropriate way of estimation in our case study.

The dynamic panel system of the Generalized Method of Moments (GMM) estimator was proposed by Arellano and Bover (1995) and Blundell and Bond (1998). As ponited out by (Asal, 2015) this method allows economic models to be specified while avoiding needless assumptions such as specifying a particular distribution for the errors. The lack of structure in the GMM made it commonly used in econometrics especially due to competing economic theories often imply that economic variables satisfy different sets of population moment conditions. In addition, GMM controls for dynamic endogeneity that arises from ignored heterogeneity and simultaneity that might exist in the regression and it is robust to model misspecification. Using GMM method allows us to use the lagged value of the dependent variables as an instrument in order to control for potential simultaneity and reverse causality, while all the explanatory variables are treated as endogenous.

I.3.2. GMM Panel analysis

The following table shows the estimation results of the first model using GMM estimator.

Table (3.17): Estimation outputs using GMM of the first model (Stock return as the dependent variable)

Variables	**Stock return**
Stock return (-1)	-0.029744 (-2.505285)**
Derivatives	-12.82598 (-4.910127)***
Size	1.548130 (5.018747)***
NIM	0.538759 (5.187282)***
Liquidity	1.448115 (5.187282)***
Credit risk	-0.017794 (-0.942880)ns
Num of Obs	98
Hansen test (J-statistic)	15.30102
P-value of Hansen test	0.082992
Arrellano & Bond test AR (1)	-1.513397
P-value of AR (1)	0.1302
Arrellano & Bond test AR (2)	0.920062
P-value of AR (2)	0.3575

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

Since the p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 9 and 10)**

Moreover, the coefficients indicate that stock return past value is significant which validate the application of GMM model. For Derivative instruments it have a negative effect on financial performance of banks at level of significance equals to 1%.

As concerning the variables size, net interest margin and liquidity they affect positively the financial performance of banks at level of significance equals to 1%.

Lastly for the variable credit risk, results show that its effect on performance is not evident due to its insignificance.

I.1.4. Summaries and Discussions

The major objective of this analysis is to determine the impact of derivative instruments on stock return performance of banks from GCC countries.

From the static panel findings indicate that the derivatives instruments have no significant effect on banks' performance. The insignificance of derivative instruments is due to the lack of data on stock return which has minimized the sample size, therefore not noteworthy results are made.

In addition, bank size affects positively the performance of banks. This finding is in line with the theory that bank size increase financial performance of banks meaning that larger banks have better performance than smaller banks.

For the variable net interest margin, the association with performance of banks was positive as it was expected comparing to literature results.

Finally, the effect of liquidity levels on bank's performance is positive which means that any increase in liquidity of the bank it leads to an increase in the financial performance of banks. As for credit risk, its effect is not obvious due to its insignificance.

Moreover, the results of GMM estimation shows a negative effect of derivative instruments on financial performance, this result contradicts the literature and it can be interpreted that banks of our sample use badly derivatives contracts to hedge their risk. Comparing to previous literature results which show a positive relationship between derivatives usage and banks performance although the majority of the previous studies are focusing on banks from developed countries, we can say that our bank sample is from emerging countries which they manage bad the use of derivatives. Therefore, they do not have a long experience in using such instruments comparing to advanced countries. In addition, emerging countries banks have used derivatives recently and that their derivatives markets are small so banks do not have many opportunities to diversify their portfolio of speculations or for hedging purposes.

As concerning the bank size its positive effect on financial performance support the theory stipulating that the size of banks influences positively bank performance. This finding suggests that large banks have better diversified asset portfolio and economies of scales thus these banks become more efficient.

For net interest margin and liquidity they affect positive the financial performance of banks. These results are as predicted and matching with the results of the previous studies. According to literature liquid assets in portfolios refer to the fact that banks are healthy. Hence, a positive relationship is conducted between the variable liquidity and bank performance.

Finally, the effect of credit risk is not clear at level of significance equals to 5%.

Ultimately, the major conclusion of this part is that banks seem to decrease their performance by using derivative instruments. Indeed, deducing results reject literature findings and the argument that stipulate that derivatives usage increase financial performance of banks. Hence, our first hypothesis is rejected.

The following table exposes a summary on the main regression results of the first model.

Table (3.18): Stock return regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	NS	NS	NS	NS	-
Size	NS	+	NS	NS	NS	+
NIM	+	+	+	+	+	+
Liquidity	-	NS	NS	-	-	+
Credit risk	NS	NS	NS	NS	NS	NS

Source: by the author depending on Eviews 9 results

I.2. The effect of financial derivatives on banks' accounting performance

The aim of this analysis is to determine the effect of derivative instruments on banks accounting performance. To achieve this aim this section is organized as follow: Data and sample are described, as well as the methodology in first place then estimation results and analysis and lastly summaries and discussions are presented.

I.2.1. Data, Sample and Methodology

I.2.1.1. Data

The performance of banks can be explained by many indicators such as banks' profitability banks' efficiency (Rivas et al 2006), net interest margin (Sinkey and Carter 2000) and bank lending behavior (Brewer, Jackson and Moser 2001). A review of literature reveals that the most used indicators are profitability indicators represented in Return on Assets and Return on Equity. Hence, yearly accounting data of banks drawn from bank focus data base are used in our model covering the period 2006-2018.

I.2.1.2. Sample

Our sample is composed of 25 banks from GCC countries as described previously. **(For more details see table (3.1))**

I.2.1.3. Methodology

At first place, we defined the used variables in the second model with then we will test our first hypothesis and the expected results comparing to the literature results.

I.2.1.3.A. Variables description

The used variables in this analysis are exposed in the next table.

Table (3.19): Variables definition

Variables	**Proxy**	**Definition**	**References**
Dependent variable			
Return on asset (ROA)	Bank performance	Net income divided by total assets.	Keffala (2012); Said (2011); Anyango (2016); (Shen & Hartarska, 2018); Keffala (2019)
Return on equity (ROE)		Net income divided by total equity	Keffala (2012); Said (2011); Keffala (2019).
Net interest margin (NIM)		Net interest income divided by total assets	Bikker (2010); Said (2011); Schmiedel and Song (2012); Albulescu (2015)
Cost to income ratio (CIR)		Total operating expenses divided by total operating income	Rivas et al (2006); Lin and Zhang (2009); Keffala (2012)
Independent variables			

Derivatives	Derivatives	The notional value of derivatives divided by total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Size	Bank size	Natural log of total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Leverage	Leverage	The ratio of the total equity divided on total asset	Li and Yu (2010); Albulescu (2015)
Liquidity	Liquidity	The ratio of liquid assets equity to total assets.	Chaudhry et al (2000); Reichert and Shyu (2003); keffala (2012)
Loan	Loan	The ratio of gross loans to total assets	Chaudhry et al (2000); Rivas et al (2006); Yong et al (2009); Keffala (2012)
Credit risk	Credit risk	The ratio of loan loss-reserves to gross loans.	Chaudhry et al (2000); Reichert and Shyu (2003).

Source: by the author depending on literature review

From the table (3.19), the dependent variable is divided to four measures as proxies for bank performance. Firstly, profitability measures presented in both return on assets (ROA) and return on equity (ROE) ratio. Secondly, net interest margin is also used as performance measure according to literature and lastly efficiency measure presented in cost to income ratio (CIR). For the independent variables, we have derivative instruments, bank size, leverage, liquidity, loan and credit risk. The choice of these variables is according to previous studies and literature as described in the previous table.

I.2.1.3.B. Testing hypotheses and expected results

As mentioned in the first part (financial performance of banks) depending on literature the performance of banks is affected positively by the use of the derivative instruments. Hence, our first hypothesis remains the same as the first part which stipulates that the effect of derivative instruments use is positive on performance of banks.

As a remainder, the variable bank size is expected to have a positive effect on the performance of banks according to literature and the theory (Rivas et al 2006; Reichert and Shyu 2002; Keffala 2012). In addition, (Rivas et al 2006; Keffala 2012) conducted that the variable loan is considered as risky asset, thus banks with small loan portfolios are required to manage much better their capital levels than banks with large portfolios. So we expect a negative relationship between loan levels and bank performance. Moreover, according to literature (Keffala 2012) liquid assets in portfolios refer to the fact that banks are healthy, so we conduct a positive relationship between the variable liquidity and bank performance. Furthermore, the effect of leverage on bank performance is expected to be positive. Lastly, the variable credit risk is predicted to have a negative effect on performance of banks (Keffala 2012).

The table (3.20) summarizes the predicted effect of the independent variables and their references.

Table (3.20): The predicted relationship between dependent variable and independent variables

Variables	Expected sign	References
Derivatives	+	Rivas et al (2006), said (2011), Keffala (2012)
Size	+	Rivas et al (2006); Reichert and Shyu (2002)
Leverage	+	Li and Yu (2010); Albulescu (2015)
Liquidity	+	Keffala (2012)
Loan	-	Rivas et al (2006); keffala (2012)
Credit risk	-	Keffala (2012)

Source: by the author depending on literature review results

I.2.2. Empirical analysis

The empirical model is represented followed by unit root test results and descriptive statistics.

I.2.2.1. Empirical model

The equation below represents the conceptual model of the first part of this section which describes the effect of derivatives on accounting performance of banks measured by Return on Assets, Return on Equity, Net Interest Margin and Cost to Income Ratio respectfully.

Second model:

$$Bank\ perfomance_{i,t} = \alpha_0 + \alpha_1 Derivatives_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Leverage_{i,t} + \alpha_4 Liquidity_{i,t} + \alpha_5 Loan_{i,t} + \alpha_6 Credit\ risk_{i,t} + \varepsilon_{it}$$

Where:
Bank performance is divided to ROA, ROE, NIM and CIR in each regression.
ε_{it}: is the random error.
The other variables are defined previously.

I.2.2.2. Unit root test

As seen in the table (3.21), the stationarity of the variables is checked using several tests. Trying with individual intercept, then individual intercept and trend and finally without individual intercept and trend. The results are as follow:

Table (3.21): Stationarity test results

Variables	LLC	IPS	ADF	PP	Decision
ROA	-14.2871 (0.0000)	-7.73430 (0.0000)	157.950 (0.0000)	187.147 (0.0000)	Stationary at level

ROE	-19.0264 (0.0000)	-9.01589 (0.0000)	169.983 (0.0000)	198.450 (0.0000)	Stationary at level
NIM	-11.5902 (0.0000)	-6.03045 (0.0000)	133.797 (0.0000)	156.317 (0.0000)	Stationary at level
CIR	-6.33645 (0.0000)	-3.0806 (0.0010)	93.0986 (0.0002)	126.837 (0.0000)	Stationary at level
Derivatives	-63.0980 (0.0000)	-12.1034 (0.0000)	82.7248 (0.0025)	78.7588 (0.0058)	Stationary at level
Size	-37.6437 (0.0000)	-15.4769 (0.0000)	99.9018 (0.0000)	115.241 (0.0000)	Stationary at level
Leverage	-21.2359 (0.0000)	-12.2931 (0.0000)	154.671 (0.0000)	228.136 (0.0000)	Stationary at level
Liquidity	-3.03821 (0.0012)	-3.33152 (0.0004)	89.4603 (0.003)	109.291 (0.0000)	Stationary at level
Loan	-29.1801 (0.0000)	-10.9453 (0.0000)	148.590 (0.0000)	160.342 (0.0000)	Stationary at level
Credit risk	-8.49817 (0.0000)	-3.90960 (0.0000)	94.4634 (0.0001)	71.5909 (0.0242)	Stationary at level

Source: by the author depending on Eviews 9 results

According to the table results, the stationarity of all variables is checked since the P value of the variables is closed to 0, which means we reject the null hypothesis of Unit Root at 5 % significance level.

I.2.2.3. Descriptive statistics

The tables below describe the statistical variables used in the second model divided according to our sample countries.

Table (3.22): Panel A. descriptive statistics of variables from UAE

UAE

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0085	0,0069	0,0276	0,0001	0,0085	0,7768	2,3887	3,4843
SIZE	5,0697	4,9894	5,6091	4,5825	0,3123	0,1107	1,9212	1,5160
ROA	1,7563	1,9000	2,6300	0,2300	0,5994	-0,8011	2,7722	3,2738
ROE	11,8553	12,2700	17,8700	2,0200	3,5458	-0,7918	3,3206	3,2633
CIR	33,4270	31,8150	46,5100	25,5000	5,6412	0,7365	2,7851	2,7702
NIM	3,3457	3,1800	4,4400	2,4000	0,5527	0,6431	2,3553	2,5876
LIQUIDITY	0,1651	0,1435	0,3268	0,0805	0,0654	1,1621	3,3801	6,9333
CREDIT_RISK	5,5157	5,0950	8,7100	2,0500	1,7830	0,1954	2,0894	1,2275
LOAN	0,6938	0,7179	0,7669	0,5093	0,0748	-1,3694	3,4916	9,6783
LEVERAGE	0,9998	0,9998	1,0000	0,9996	0,0001	-0,8039	2,6723	3,3657

Source: by the author depending on Eviews 9 results

All variables are normally distributed in UAE except for liquidity and loan according to Jarque-Bera probability, while Skewness is ranging from -1.36 to 1.16 and Kurtosis has an average of 2.71 also ranging from 1.92 to 3.49. For the variable derivatives ‘average is 0.0085 with a maximum of 0.02 and standard deviation of 0.0085. In addition, the variable size has a maximum of 5.60 and standard deviation of 0.31 with an average of 5.06; while return on assets and return on equity have an average of 1.75 and 11.85 respectively with a standard deviation of 0.59 and 3.54 also respectively. Concerning cost to income ration its maximum value is 46.51 and its standard deviation is equal to 5.64. For net interest margin has a maximum of 4.44 and a standard deviation of 0.55. Moreover, the variable liquidity has an average of 0.16 and maximum value of 0.32 with a standard deviation of 0.06. Furthermore, the variable credit risk has a standard deviation of 1.78 and maximum value of 8.71. Finally, loan has an average of 0.69 with a standard deviation of 0.07 while leverage has an average of 0.99 and its standard deviation is equal to 0.001.

Table (3.23): Panel B. descriptive statistics of variables from Bahrain

Bahrain

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0046	0,0034	0,0211	0,0002	0,0046	1,7711	6,5997	32,9433
SIZE	4,2495	4,3939	6,5755	3,2289	0,7736	1,3594	5,9007	21,0746
ROA	1,1913	1,3150	2,0600	-2,7300	0,8015	-3,7595	19,2098	425,7263
ROE	10,4272	12,3600	18,5600	-39,3900	9,8529	-4,1734	21,8193	565,1143
CIR	42,4959	42,2950	57,9900	28,3200	8,8939	-0,0653	1,8028	1,9339
NIM	2,2597	2,3450	3,1300	1,1300	0,5148	-0,3775	2,4019	1,2371
LIQUIDITY	0,1898	0,1928	0,3454	0,0000	0,0742	-0,6783	3,8828	3,4932
CREDIT_RISK	3,9457	3,9050	6,9000	1,3900	1,2763	0,2143	3,3176	0,3557
LOAN	0,4953	0,5403	0,6502	0,0000	0,1427	-2,6640	9,7828	99,1933
LEVERAGE	0,9984	0,9995	0,9998	0,9934	0,0018	-1,1991	3,1734	7,2263

Source: by the author depending on Eviews 9 results

In Bahrain, the results show that all variables are normally distributed according to Jarque-Bera probability while Skewness ranges from -4.17 to 1.77 and Kurtosis had an average of 7.78. Derivatives in Bahrain have an average of 0.0046 with a maximum value of 0.0211 and a standard deviation of 0.0046. For the variable size it has an average of 4.24 and standard deviation of 0.77 while maximum value is equal to 6.57. In addition, return on assets and return on equity have an average of 1.19 and 10.42 respectively, while net interest margin and cost to income ration have a maximum of 4.44 and 57.99 with standard deviation of 8.89 and 0.51 respectively. Moreover, the maximum value of liquidity is equal to 0.18 while its standard deviation is 0.07. However, the variable credit risk has a maximum value of 6.90 and a standard deviation of 1.27. For loan and leverage, the standard deviation is equal to 0.14 and 0.0018 respectively while their averages are 0.49 and 0.99 also respectively.

Table (3.24): Panel C. descriptive statistics of variables from Kuwait

Kuwait

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0003	0,0002	0,0008	0,0000	0,0003	0,2922	1,3065	1,4711
SIZE	3,8373	3,5915	4,3729	3,3899	0,4194	0,1863	1,1817	1,5790
ROA	1,4418	1,3700	2,2900	0,9800	0,4025	0,9971	3,1304	1,8306
ROE	11,5282	12,2300	14,0100	9,1500	1,9935	-0,0196	1,2346	1,4292

CIR	34,0073	33,2000	39,6900	30,0000	2,8018	0,7263	2,6798	1,0140
NIM	3,1109	3,1000	3,5300	2,8400	0,2508	0,6229	2,0062	1,1641
LIQUIDITY	0,2390	0,2410	0,3338	0,1555	0,0541	0,0385	2,1335	0,3468
CREDIT_RISK	3,9200	3,9100	4,3500	3,3000	0,3740	-0,3476	1,7586	0,9278
LOAN	0,6504	0,6422	0,7144	0,5703	0,0508	-0,0841	1,6002	0,9111
LEVERAGE	0,9977	0,9976	0,9994	0,9956	0,0015	-0,2102	1,4551	1,1748

Source: by the author depending on Eviews 9 results

In Kuwait all variables are normally distributed according to Jarque-Bera results and Skewness ranges from -0.21 to 0.99 while Kurtosis ranges from 1.18 to 3.13. The average of derivatives is 0.003 with a maximum of 0.008 and standard deviation of 0.003. For the variable size the maximum value is 4.37 while the standard deviation is equal to 0.41 with an average of 3.83. In addition, return on assets and return on equity have an average of 1.44 and 11.52 respectively while the variable net interest margin has a maximum value of 3.53 and a standard deviation of 0.25. For the variable cost to income ratio the maximum is 39.69 with a standard deviation of 2.80. Liquidity had an average of 0.23 and standard deviation of 0.05. Moreover, credit risk has a maximum of 4.35 with a standard deviation of 0.37. Lastly, loan has an average of 0.65 while leverage has a standard deviation of 0.0015 with an average of 0.99.

Table (3.25): Panel D. descriptive statistics of variables from Qatar

Qatar

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0017	0,0006	0,0098	0,0000	0,0022	2,0455	7,1962	41,5007
SIZE	4,8713	4,7960	5,7313	4,2534	0,4335	0,5973	2,4120	2,1420
ROA	2,1355	2,2500	2,8800	1,1600	0,4894	-0,4872	2,4068	1,5727
ROE	15,0048	14,8700	25,4800	8,1900	4,4525	0,3283	2,3312	1,0613
CIR	31,4310	32,9200	42,6100	15,7500	7,7625	-0,5335	2,3743	1,8487
NIM	2,8366	2,9200	3,8000	1,7000	0,5386	-0,7449	2,9181	2,6901
LIQUIDITY	0,1360	0,1374	0,2668	0,0559	0,0498	0,6349	3,3913	2,1330
CREDIT_RISK	2,1110	2,0100	3,6400	0,6600	0,8383	0,1711	2,0279	1,2834
LOAN	0,6266	0,6398	0,7562	0,3942	0,0849	-1,0353	3,9250	6,2147
LEVERAGE	0,9997	0,9998	1,0000	0,9992	0,0002	-0,8932	2,8858	3,8720

Source: by the author depending on Eviews 9 results

According to The results, Jarque-Bera indicates that all variables are normally distributed except for derivatives and loan in Qatar. As for Skewness it is ranging from -1.03 to 2.04 and Kurtosis is also ranging from 2.33 to 7.19. Concerning the variable derivatives in Qatar it has an average of 0.0017 with a maximum of 0.0098 and a standard deviation of 0.0022; while the variable size standard deviation is equal to 0.43 with a maximum of 5.7 and an average of 4.87. Moreover, return on assets and return on equity have an average of 2.13 and 15.00 respectively; while cost to income ratio has a standard deviation of 7.76 and a maximum of 42.61. For net interest margin, it has a standard deviation equals to 0.53 and a maximum of 3.80. Furthermore, liquidity maximum value is equal to 0.26 and a standard deviation of 0.04 while average is equal to 0.13; credit risk has a maximum of 3.64 and a standard deviation of 0.83 while loan standard deviation is 0.08 and a maximum of 0.75 while its average is 0.62. For leverage, its average is 0.99 with a standard deviation of 0.002.

Table (3.26): Panel E. descriptive statistics of variables from Saudi Arabia

Saudi Arabia

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0113	0,0118	0,0345	0,0009	0,0097	0,7439	2,6133	3,5443
SIZE	5,1664	5,2311	5,3715	4,7117	0,1732	-1,3287	4,0145	12,1370
ROA	1,9331	1,9300	2,3800	0,8700	0,3457	-0,8499	3,6450	4,9576
ROE	13,4797	13,5500	18,4300	5,6500	2,7796	-0,4121	3,3629	1,2165
CIR	34,1456	33,7550	40,9100	27,6800	3,9260	0,1389	1,7205	2,5715
NIM	2,5967	2,5950	3,0500	1,9300	0,2522	-0,6369	3,5405	2,8720
LIQUIDITY	0,1123	0,1002	0,2200	0,0587	0,0361	0,8010	3,3623	4,0464
CREDIT_RISK	2,4769	2,1100	7,6500	1,3000	1,3073	2,3649	9,0555	88,5601
LOAN	0,6200	0,6303	0,6919	0,4480	0,0528	-1,4614	5,3260	20,9292
LEVERAGE	0,9999	0,9999	0,9999	0,9997	0,0001	-2,5434	8,4121	82,7500

Source: by the author depending on Eviews 9 results

For Saudi Arabia results the variables are normally distributed according to Jarque-Bera except for size, credit risk and loan. Skewness ranges from -2.54 to 2.36 while Kurtosis ranges also from 1.72 to 9.05. The average of derivatives in Saudi Arabia banks is equal to 0.0113 with a maximum of 0.0345 and a standard deviation of 0.0097; for size the average is 5.16 with a standard deviation of 0.17 and a maximum of 5.37. Moreover, return on assets and return on equity averages are 1.93 and 12.47 respectively, while the cost to income ratio has a maximum of 40.91 with a standard deviation of 3.92. In addition, the maximum value of net interest margin is 3.05 with a standard deviation of 0.25; while liquidity standard deviation is 0.03 and maximum of 0.22 with an average of 0.11. Moreover, credit risk maximum value is 7.65 with a standard deviation of 1.30; lastly loan and leverage averages are 0.62 and 0.99 respectively.

Table (3.27): Panel F. descriptive statistics of variables from Oman

Oman

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0020	0,0017	0,0067	0,0000	0,0019	0,8872	3,0068	2,4927
SIZE	3,5084	3,4045	4,0985	2,9868	0,3199	0,4095	2,0376	1,2643
ROA	1,4716	1,7100	2,0400	0,3400	0,5437	-1,2055	2,8420	4,6214
ROE	11,4058	13,2200	14,6600	2,8400	4,1983	-1,3105	2,9004	5,4462
CIR	53,5126	47,3600	85,0200	40,7300	14,9782	1,1735	2,8419	4,3806
NIM	3,1374	3,2100	3,9100	2,3500	0,4676	-0,0981	1,9581	0,8898
LIQUIDITY	0,1828	0,1708	0,2754	0,1262	0,0431	0,5930	2,3237	1,4757
CREDIT_RISK	3,4642	3,4200	4,7400	2,2800	0,6486	0,3406	2,3589	0,6928
LOAN	0,6794	0,7168	0,8017	0,4792	0,1095	-0,7164	2,0382	2,3576
LEVERAGE	0,9950	0,9952	0,9991	0,9879	0,0031	-0,6383	2,8048	1,3204

Source: by the author depending on Eviews 9 results

Oman results indicate that all variables were normally distributed according to Jarque-Bera and Skewness ranges from -1.31 to 1.17 while Kurtosis ranges from 1.95 to 3.00. For the variable derivatives maximum value is 0.0067 with an average of 0.0020 and a standard deviation of 0.0019. Concerning the variable size' average is 3.50 with a maximum of 4.09 and a standard deviation of 0.31. Additionally, the averages of both return on assets and return on equity are 1.47 and 11.40 respectively, while cost to income ratio and net interest margin maximum value are 85.02 and 3.91 respectively. For liquidity the average is equal to 0.18 with a standard deviation of 0.04 and a maximum value of 0.27. In addition, credit risk maximum value is 4.74 with a standard deviation of 0.64. Lastly, the averages of loan and leverage are 0.67 and 0.99 respectively.

As a conclusion, UAE banks are the most users of derivative instruments in GCC countries with a standard deviation of 0.0085. Moreover, the Saudi Arabian banks are the larger banks while the smallest banks are Kuwait banks. As for performance indicators return on assets and return on equity, the highest performance of banks is in Qatar commercial banks with a score of 25.48 as a maximum value for ROE following by Bahrain, Saudi Arabia, UAE and lastly Oman. However, the risk was higher in Bahrain banks and its lowest was in Kuwait banks. The indicator ROA shows that Qatar banks are the most well performed banks with a score of 2.88 followed by UAE, Saudi Arabia, Kuwait, Bahrain and Oman. As for the risk, it was higher in Bahrain banks and lower in Saudi Arabia banks.

Furthermore, for net interest margin the highest scores are in UAE banks followed by Oman, Qatar, Kuwait, Bahrain and lastly Saudi Arabia where the standard deviation in UAE is the highest with a score of 0.5527 and the lowest standard deviation is in Kuwait, while cost to income ratio was at its higher value in Oman banks with a score of 85.02 followed by Bahrain, UAE, Qatar, Saudi Arabia and lastly Kuwait. Its risk was higher in Oman as well, and the lowest value was in Kuwait banks.

Additionally, the high liquidity levels is in Kuwait banks followed by Oman, Bahrain, UAE, Qatar and lastly Saudi Arabia, for the standard deviation which is a measure of risk the highest level is in Bahrain and the lowest in Saudi Arabia. In addition, UAE banks have the highest level of credit risk followed by Saudi Arabia, Bahrain, Oman, Kuwait and lastly Qatar, while the standard deviation high level is in UAE and the lowest is in Kuwait. The highest level of loan is in UAE followed by Oman, Kuwait, Qatar, Saudi Arabia and Bahrain with Bahrain and Oman as it have the highest level of standard deviation while Kuwait and Saudi Arabia have the lowest level of Standard deviation. Finally, the highest level of leverage is in UAE banks followed by Saudi Arabia, Qatar, Bahrain, Kuwait and lastly Oman. However, the risk was higher in Oman banks and lower in UAE and Saudi Arabia.

I.2.3. Regression analysis

I.2.3.1. Static Panel analysis

Firstly, we will begin the estimation with the variable Return on Assets as a measure for accounting performance. The table (3.28) represents the estimation results of the first model.

Table (3.28): Estimation outputs of the second model (Return on Assets as the dependent variable)

Independent Variable	Method of estimation			
	PLS	**FEM**	**DFE**	**REM**
C	65.17003 (1.570086)^{ns}	70.27306 (1.495099)^{ns}	39.65993 (0.974509)^{ns}	94.70933 (2.287151)**
Derivatives	-11.47883 (-1.809965)*	-20.15418 (-2.588550)***	-12.56666 (-1.810446)*	-11.44544 (-1.667026)*
Size	0.458987 (3.036090)***	-2.316679 (-5.647350)***	-2.252432 (-3.694043)***	0.272989 (1.420869)^{ns}
Leverage	-65.96405 (-1.568711)^{ns}	-56.33386 (-1.176968)^{ns}	-26.82109 (-0.649066)^{ns}	-93.77806 (-2.232086)**
Liquidity	2.120959 (2.365072)**	-0.448232 (-0.404470)^{ns}	0.526051 (0.538806)^{ns}	2.489212 (2.705177)***
Loan	1.106522 (1.757285)*	-1.530836 (-1.304358)^{ns}	-0.675997 (-0.630080)^{ns}	-0.620212 (-0.740094)^{ns}
Credit risk	-0.141517 (-4.379741)***	-0.063218 (-1.960177)**	-0.037871 (-1.225433)^{ns}	-0.114557 (-3.886824)***
Log likelihood	-252.6899	-170.4211	-131.3053	-
S.E	0.779689	0.568675	0.487469	0.640153
R^2	0.143841	0.566110	0.717432	0.099959
F statistic	5.936271***	9.249116***	11.65321***	3.924157***
DW	0.617294	0.632685	1.365660	0.886762
No of Obs	219	219	219	219
Hausman test				
Dependent variable ROA	**Chi 2 (6)**		**Prob < Chi 2**	
	63.915474		0.0000	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

For the PLS model, the results of estimations indicate that derivatives have a negative effect on the performance measure represented in ROA at level of significance equals to 10% which means that when banks uses derivatives contracts it decreases their return on assets due to the risks of these contracts when their purpose of use is not for hedging purposes but for speculation purposes. Additionally, credit risk affects negatively ROA at level of significance equal to 1%. This result revealed that banks facing credit risks have a low return on assets than banks which control their credit risks. While leverage have also a negative effect on return on assets but it is not statically significant. In contrast, the variables size, liquidity and loan have positive effects on return on assets of banks at levels of significance equal to 1%, 5% and 10% respectively. Larger banks tends to have level of return on assets more than smaller banks according to the variable size which represents the size of banks, while the higher levels of liquidity the more return on assets banks can achieve. As for the variable loan the more banks gives loan the more return of assets they achieve. Moreover, according to fisher statistic, the model is accepted at level of significance equal to 5% while R square equals to 14%. **(See appendix 11)**

The fixed effect model is accepted according to fisher statistic, and R square has improved to 59%. The effect of derivatives remains the same comparing to PLS model with an improvement in level of significance which equals to 1% while the effect bank size changed from positive to negative effect due to the addition of fixed effect and it is significant at 1%. For credit risk effect on return on asset it remains the same negative effect accepted at level of significance equals to 5%. While, for the rest of variables leverage, liquidity and loan they are not significant. **(See appendix 12)**

Observing the results from the DFE model, no changes in coefficients signs for all independent variables comparing to the fixed effect model only the variable credit risk became insignificant. In addition, R square has improved as well as before from 59% to 71%, and the model is accepted as the previous model. **(See appendix 13)**

Moreover, the random effect model is accepted according to fisher statistic at level of significance equal to 5%, R square has decreased to 9% and the coefficient signs did not change comparing to the previous model except for the variable size it became positively correlated to return on assets but it is statically insignificant as well as the insignificance of the variable loan. While, the variable leverage has a negative effect on return on asset at level of significance equals to 5% which means that when banks level of leverage increases it affect their performance levels because of the high levels of leverage in banks, it might cause major risks if it is not well studied and choosing the appropriate level of leverage according to the bank financial structure. The rest of variables have the same effects as the PLS model and their effects are statically significant. **(See appendix 14)**

Furthermore, from Hausman test results we conclude that Chi square which equal to 63.915474 indicate that the studied variables have a fixed effect, as the probability is less than 5% we rejected the null hypothesis and accept the alternative hypothesis which says that the fixed effects models are most appropriate models. **(See appendix 15)**

I.2.3.2. Specifications tests results

I.2.3.2.A. Matrix of correlation

The correlations between variables of the second model are presented in the following matrix:

Table (3.29): Matrix of correlations (Return on Assets is the dependent variable)

	Derivatives	**Size**	**Leverage**	**Liquidity**	**Loan**	**CreditR**	**Constant**
Derivatives	1.0000						
Size	-0.3056	1.0000					
Leverage	0.1037	-0.7768	1.0000				
Liquidity	-0.1080	0.3607	-0.1302	1.0000			

Loan	0.0284	-0.0670	0.1174	0.2646	1.0000		
CreditR	0.0178	0.0209	0.0994	-0.1540	-0.0792	1.0000	
Constant	-0.1008	0.7689	-0.9999	0.1199	-0.1280	-0.1021	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.30): Multicollinearity test results of the second model

	VIF	1/VIF
Size	3.74	0.267369
Leverage	3.05	0.328082
Liquidity	1.42	0.704924
Derivatives	1.17	0.851428
Loan	1.11	0.897706
CreditR	1.10	0.906193
Mean VIF	1.93	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the coefficients are less than 5.

I.2.3.2.B. Heteroscedasticity test

From the table (3.31), the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it was less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 16)**

Table (3.31): Breusch-Pagan Heteroskedasticity test

Dependent variable	Chi 2(1)	P –value
ROA	11.69	0.0006

Source: by the author according to Stata16 results

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.32): White test results for heteroskedasticity

Dependent variable	Chi 2(27)	P –value
ROA	28.14	0.4039

Source: by the author according to Stata16 results

Hence, according to the p value of white test we accept the null hypothesis and reject the alternative hypothesis confirming the absence of heteroskedasticity in our model. **(For more details see appendix 17)**

I.2.3.2.C. Endogeneity test

The table (3.33) represents the results of endogeneity test.

Table (3.33): Endogeneity test results (Return on asset dependent variable)

Instruments		Chi-sq (1)	P-value
Included	Leverage, liquidity, loan, credit risk.	28.137	0.0000
Excluded	Size		
Included	Size, liquidity, loan, credit risk.	1.419	0.2336
Excluded	Leverage		
Included	Size, leverage, loan, credit risk	0.169	0.6813
Excluded	Liquidity		
Included	Size, leverage, liquidity, credit risk	1.740	0.1872
Excluded	Loan		
Included	Size, leverage, liquidity, loan	3.886	0.0487
Excluded	Credit risk		

Source: by the author according to Stata 16 results

The results show that the p-value of the majority estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. **(See appendix 18)**

Due to the existence of endogeneity problem and the number of banks (groups) is greater than the number of the time period we can apply the dynamic panel system of the Generalized Method of Moments estimator which is considered the most appropriate way of estimation in our case study.

I.2.3.3. GMM Panel analysis

The following table summarizes the estimation results of our second model were ROA is used as a measure of accounting performance using GMM.

Table (3.34): Estimation outputs using GMM of the second model (Return on asset dependent variable)

Variables	ROA
ROA (-1)	0.377628 $(6.605845)^{***}$
Derivatives	-18.99363 $(-3.208539)^{***}$
Size	0.140361 $(0.550020)^{ns}$
Leverage	-176.7419 $(-4.441147)^{***}$
Liquidity	-0.468860 $(-0.858556)^{ns}$
Loan	-2.659614

	(-6.460426)***
Credit risk	-0.047731 (-1.900349)*
Num of Obs	176
Hansen test (J-statistic)	22.37361
P-value of Hansen test	0.215819
Arrellano & Bond test AR (1)	-1.301477
P-value of AR (1)	0.1931
Arrellano & Bond test AR (2)	0.420694
P-value of AR (2)	0.6740

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

Since the p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 19 and 20)**

The significance of the lagged dependent value return on assets confirms the applications of the GMM model. For Derivative instruments a negative effect on financial performance of banks is detected at level of significance equals to 1%.

The effect of the variables size and liquidity on banks performance is unclear because of the insignificance of their coefficients.

Moreover, concerning the variables leverage loan and credit risk affect negatively the performance of banks at level of significance equals to 1% for leverage, loan and at 10% for the variable credit risk.

I.2.4. Summaries and Discussions

This analysis aims to determine the effect of derivative instruments on return on assets of banks from GCC countries.

From the static panel findings indicate that the derivatives instruments have a negative effect on banks' performance. This can be interpreted by the fact that banks of our sample are using derivative instruments for speculation purposes which means that they are using these instruments badly since these banks are from GCC countries so they do not have a long experience in using such instruments in addition to the small size of derivatives markets comparing to other banks from advanced countries.

In addition, bank size affects negatively the performance of banks. This finding is contrary to the theory stipulating that the size of banks influences positively bank performance. This finding suggests that smaller banks have better diversified asset portfolio and economies of scales thank larger banks.

The variables leverage and loans have no significant effect on performance of banks.

The effect of liquidity levels on bank's performance is positive which means that any increase in liquidity of the bank it leads to an increase in the financial performance of banks. As predicted, this finding is in line with literature. For credit risk, it affect negatively return on assets revealing that banks facing credit risks have a low return on assets than banks which control their credit risks

Moreover, the results of GMM estimation shows that derivative instruments affect negatively on financial performance, this result contradicts the literature and it can be interpreted that banks of our sample use badly derivatives contracts to hedge their risk.

Comparing to previous literature results which show a positive relationship between derivatives usage and banks performance although the majority of the previous studies are focusing on banks from developed countries, we can say that our study the banks sample is from emerging countries which they manage bad the use of derivatives. Thereby, they do not have a long experience in using such instruments comparing to advanced countries. In addition, emerging countries banks have used derivatives recently and that their derivatives markets are small so banks do not have many opportunities to diversify their portfolio of speculations.

As concerning the bank size and liquidity effects on performance of banks is not clear and cannot be predictable due to the insignificance of their coefficient.

For leverage, loan and credit risk their effect is negative on banks performance. This can be explained by the facts that these variables are proxies of risky assets which mean that the higher level of loan means that performance is badly affected.

Ultimately, the major conclusion of this part is that banks seem to decrease their performance by using derivative instruments. Indeed, deducing results reject literature findings and the argument that stipulate that derivatives usage increase financial performance of banks. Thus, our first hypothesis is rejected.

The following table summarizes the main regression results of our model.

Table (3.35): ROA regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	-	-	-	-	-	-
Size	+	-	-	NS	-	NS
Leverage	NS	NS	NS	-	NS	-
Liquidity	+	NS	NS	+	+	NS
Loan	+	NS	NS	NS	NS	-
Credit risk	-	-	NS	-	-	-

Source: by the author depending on Eviews 9 results

I.2.5. Regression Analysis

I.2.5.1. Static Panel Analysis

In the next table, the estimation results of the second model where Return on Equity is used as a measure for accounting performance are summarized.

Table (3.36): Estimation outputs of the second model (Return On Equity as the dependent variable)

Independent Variable	Method of estimation			
	PLS	FEM	DFE	REM
C	314.4461 (0.873304)ns	-259.4901 (-0.586751)ns	-553.1768 (-1.348829)ns	188.7679 (0.501072)ns
Derivatives	-42.91807 (-0.780111)ns	-121.4683 (-2.588550)*	-66.11652 (-0.945224)ns	-49.83235 (-0.799045)ns
Size	2.231541 (1.701619)*	-19.90794 (-5.157714)***	-11.73910 (-1.910486)*	0.873410 (0.524931)ns
Leverage	-316.2156 (-0.866887)ns	317.7476 (0.825459)ns	618.3259 (1.484872)ns	-180.8332 (-0.473237)ns
Liquidity	16.53335 (2.125282)**	7.841104 (0.751991)ns	12.62886 (1.283594)ns	26.89440 (3.223853)***
Loan	11.42413 (2.091458)**	-6.262675 (-0.567127)ns	4.890223 (0.452313)ns	2.103582 (0.287262)ns
Credit risk	-1.265201 (-4.513814)***	-0.599141 (-1.974392)**	-0.141390 (-0.454003)ns	-1.067608 (-3.930065)***
Log likelihood	-725.8208	-661.3483	-637.2562	-
S.E	6.763595	5.350722	4.912338	5.813679
R^2	0.120232	0.511730	0.608162	0.096343
F statistic	4.828791***	6.567775***	7.123630***	3.767047***
DW	0.855163	1.477962	1.701863	1.143016
No of Obs	219	219	219	219
Hausman test				
Dependent variable ROE	**Chi 2 (6)**		**Prob < Chi 2**	
	45.020139		0.0000	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

In the first model, the results of estimations indicate that the variables size, liquidity and loan have a positive effect on the performance measure represented in ROE at level of significance equals to 10% for the variable size and 5% for liquidity and loan. These results mean firstly for the variable size that when banks are larger their return on equity increases which means that they are growing and have a positive performance. For liquidity, banks that have liquid assets in their portfolios reflect the fact that these banks are well managed and it affect positively their performance. Lastly for the variable loan which is considered as a risky asset, a positive effect of this variable on performance of banks support the theory that banks with small loan portfolios are required to manage their capital levels better than banks with large portfolios.

Additionally, credit risk also affects negatively ROE at level of significance equal to 1%, which means that banks facing credit risks have a low return on equity than banks which control their credit risks. While the effect of both leverage and derivatives are not statically significant. Furthermore, according to fisher statistic, the model is accepted at level of significance equal to 5% while R square is 12%. **(See appendix 21)**

The fixed effect model is accepted according to fisher statistic, and R square has improved to 51%. The variables derivatives, size and credit risk have a negative relationship with return on equity at levels of significance equals to 10%, 1% and 5% respectively. For the variable derivatives, the negative relationship can be explained by the fact that when banks uses derivatives contract for hedging purposes they will eventually reduce risks that they face, consequently the return on equity that investors asks will be lower due to the safety feeling that hedge will give to both the investors and managers of banks, while for size the negative effect of growing banks on return on equity maybe due to agency problems. Lastly for the credit risk negative effect it may be explained like the previous model, the higher level of credit risk the higher requested return by the investors due to the negative effect on performance of banks. Furthermore, for the rest of variables leverage, liquidity and loan they are not significant. **(See appendix 22)**

Observing the results from the DFE model, no changes in coefficients signs for all independent variables comparing to the fixed effect model only the variables derivatives and credit risk became insignificant. In addition, R square has improved as well as before from 51% to 60%, and the model is accepted as the previous model at level of significance equals to 5%. **(See appendix 23)**

Additionally, the random effect model is accepted according to fisher statistic at level of significance equal to 5%, R square has decreased to 9% and the coefficient signs did not change comparing to the previous model except for the variable size it becomes positively correlated to return on assets but it is statically insignificant as well as the variable derivatives, it has a negative effect but not significant. While, the variables liquidity and credit risk have the same effect like the PLS model and they are statically significant. **(See appendix 24)**

From Hausman test results we conclude that Chi square which equal to 45.020139 indicate that the studied variables have a fixed effect, as the probability is less than 5% we rejected the null hypothesis and accept the alternative hypothesis which says that the fixed effects models are most appropriate models. **(See appendix 25)**

I.2.5.2. Specification tests results

I.2.5.2.A. Matrix of correlation

The table (3.37) exposes the correlations between variables of the second model.

Table (3.37): Matrix of correlations (Return on Equity is the dependent variable)

	Derivatives	Size	Leverage	Liquidity	Loan	CreditR	Constant
Derivatives	1.0000						
Size	-0.3056	1.0000					
Leverage	0.1037	-0.7768	1.0000				

Liquidity	-0.1080	0.3607	-0.1302	1.0000			
Loan	0.0284	-0.0670	0.1174	0.2646	1.0000		
CreditR	0.0178	0.0209	0.0994	-0.1540	-0.0792	1.0000	
Constant	-0.1008	0.7689	-0.9999	0.1199	-0.1280	-0.1021	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.38): Multicollinearity test results of the second model

	VIF	1/VIF
Size	3.74	0.267369
Leverage	3.05	0.328082
Liquidity	1.42	0.704924
Derivatives	1.17	0.851428
Loan	1.11	0.897706
CreditR	1.10	0.906193
Mean VIF	1.93	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the coefficients are less than 5.

I.2.5.2.B. Heteroscedasticity test

The table (3.40) shows the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it was less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 26)**

Table (3.39): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P –value
ROE	23.66	0.0000

Source: by the author according to Stata16 results

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.40): White test for Heteroskedasticity

Dependent variable	Chi 2(27)	P –value
ROE	30.46	0.2941

Source: by the author according to Stata16 results

Hence, according to the p value of white test we accept the null hypothesis and reject the alternative hypothesis confirming the absence of heteroskedasticity in our model. **(For more details see appendix 27)**

I.2.3.2.C. Endogeneity test

The following table represents the estimation results of the second model where the dependent variable is ROE.

Table (3.41): Endogeneity test results (Return on equity dependent variable)

Instruments		Chi-sq (1)	P-value
Included	Leverage, liquidity, loan, credit risk.	24.048	0.0000
Excluded	Size		
Included	Size, liquidity, loan, credit risk.	0.701	0.4026
Excluded	Leverage		
Included	Size, leverage, loan, credit risk	0.582	0.4456
Excluded	Liquidity		
Included	Size, leverage, liquidity, credit risk	0.331	0.5649
Excluded	Loan		
Included	Size, leverage, liquidity, loan	3.941	0.0471
Excluded	Credit risk		

Source: by the author according to Stata 16 results

According to the table (3.41), the results show that the p-value of the majority estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. **(For more details see appendix 28)**

According to the test of specification, our model suffer from the existence of endogeneity problem and the number of banks (groups) is greater than the number of the time period we can apply the dynamic panel system of the Generalized Method of Moments estimator which is considered the most appropriate way of estimation in our case study.

I.2.5.3. GMM Panel analysis

The table (3.42) summarizes the estimation results of our second model were ROE is used as a measure of accounting performance using GMM.

Table (3.42): Estimation outputs using GMM of the second model (Return on equity dependent variable)

Variables	ROE
ROE (-1)	0.228679 $(4.010494)^{***}$
Derivatives	-179.7616 $(-3.600831)^{***}$
Size	-3.782397 $(-1.532171)^{ns}$
Leverage	-618.1860 $(-1.191608)^{ns}$
Liquidity	2.859075

	(0.361330)^{ns}
Loan	-22.48360 (-3.855195)***
Credit risk	-1.265555 (-5.297123)***
Num of Obs	176
Hansen test (J-statistic)	22.09929
P-value of Hansen test	0.227607
Arrellano & Bond test AR (1)	-1.16
P-value of AR (1)	0.247
Arrellano & Bond test AR (2)	0.86
P-value of AR (2)	0.387

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

Since the p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 29 and 30)**

The validation of the GMM model is confirmed due to the significance of the lagged value of the dependent variable return on equity.

For Derivative instruments a negative effect on financial performance of banks is detected at level of significance equals to 1%. In addition, the effect of the variables size, leverage and liquidity on banks performance is unclear because of the insignificance of their coefficients. Moreover, concerning the variables loan and credit risk affect negatively the performance of banks at level of significance equals to 1%.

I.2.6. Summaries and Discussions

Our analysis aims to determine the effect of derivative instruments on return on equity of banks from GCC countries.

From the static panel findings indicate that the derivatives instruments have no significant effect on return on equity. Hence, the effect of derivatives on performance of banks is not clear.

In addition, bank size affects negatively the performance of banks. This finding is contrary to the theory stipulating that bank size influences positively bank performance. This finding implies that smaller banks have better performance than large banks which is relative to our sample banks.

For the variable leverage and loan their effect on performance of banks is not evident.

As predicted, the effect of liquidity levels on bank's performance is positive which means that any increase in liquidity of the bank it leads to an increase in the financial performance of banks. This finding is in line with literature results.

Finally, credit risk affects negatively the bank's performance. This can be interpreted by the fact that the higher level of loan means that performance is affected badly considering credit risk as proxy of risky asset.

The results of GMM estimation indicate that there is a negative effect of derivative instruments on financial performance. This result contradicts the literature and it can be interpreted that banks of our sample use badly derivatives contracts to hedge their risk. Comparing to previous literature results which show a positive relationship between derivatives usage and banks performance although the majority of the previous studies are focusing on banks from developed countries, we can say that our study the banks sample is from emerging countries which they manage bad the use of derivatives. Therefore, they do not have a long experience in using such instruments comparing to advanced countries. In addition, emerging countries banks have used derivatives recently and that their derivatives markets are small so banks do not have many opportunities to diversify their portfolio of speculations.

As concerning the bank size, leverage and liquidity effects on performance of banks is not clear and cannot be predictable due to the insignificance of their coefficient.

For loan and credit risk their effect is negative on banks performance. This can be explained by the fact that these variables are proxies of risky assets which mean that the higher level of both loan and credit risk means that performance is badly affected and in a decrease.

The major conclusion of this part is that banks seem to decrease their performance by using derivative instruments. Indeed, deducing results reject literature findings and the argument that stipulate that derivatives usage increase financial performance of banks. Hence, our first hypothesis is rejected.

The next table summarizes the main regression results of our model.

Table (3.43): ROE regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	-	NS	NS	NS	-
Size	+	-	-	NS	-	NS
Leverage	NS	NS	NS	NS	NS	NS
Liquidity	+	NS	NS	+	+	NS
Loan	+	NS	NS	NS	NS	-
Credit risk	-	-	NS	-	-	-

Source: by the author depending on Eviews 9 results

I.2.7. Regression Analysis

I.2.7.1. Static Panel Analysis

The table (3.44) represents the estimation results of the second model where Net Interest Margin is used as a measure for accounting performance.

Table (3.44): Estimation outputs of the second model (Net Interest Margin as the dependent variable)

Independent Variable	Method of estimation			
	PLS	**FEM**	**DFE**	**REM**
C	9.357694 (0.328635)ns	-12.31570 (-0.413440)ns	-11.52841 (-0.380779)ns	6.291200 (0.228650)ns
Derivatives	-7.539893 (-1.733035)*	-5.636105 (-1.141767)ns	-6.730425 (-1.303400)ns	-2.570874 (-0.563736)ns
Size	0.004582 (0.044185)ns	-1.569876 (-6.038321)***	-1.682602 (-3.709377)***	-0. 333997 (-2.356637)**
Leverage	-8.853986 (-0.306933)ns	21.77671 (0.717893)ns	21.40247 (0.696219)ns	-3.139870 (-0.112411)ns
Liquidity	0.315579 (0.512968)ns	-1.868245 (-2.660047)***	-1.818243 (-2.503375)**	-0.326434 (-0.529142)ns
Loan	3.298935 (7.637049)***	1.045662 (1.405827)ns	1.244408 (1.559135)ns	1.590379 (2.676724)***
Credit risk	0.081938 (3.696516)***	0.120613 (5.900908)***	0.114553 (4.982608)***	0.097037 (5.047469)***
Log likelihood	-170.1570	-70.54002	-66.522447	-
S.E	0.534874	0.360406	0.362642	0.386602
R^2	0.294307	0.715869	0.726105	0.164093
F statistic	14.73565***	15.78887***	12.16754***	6.936123***
DW	0.315711	0.750121	0.717242	0.532858
No of Obs	219	219	219	219

Hausman test

Dependent variable NIM	Chi 2 (6)	Prob < Chi 2
	39.707072	0.0000

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

Observing the results from the PLS model, the variable derivatives has a negative effect on the performance measure represented in NIM at level of significance equals to 10% which means that banks that uses derivatives contracts have a low levels of net interest margin comparing to the banks that do not use these contracts and this can be explained due to the complexity of these contracts and their use for non-hedging purposes. In contrast, the variables loan and credit risk have a positive effect of levels of net interest margin at level of significance equals to 1%. These results mean firstly for the variable loan that when banks give more loans which improve their performance represented in net interest and this positive relationship is as predicted supporting the theory that banks with large loan portfolios manage their capital levels in an appropriate way thereby their performance will increase.

Consequently, by this step they are managing the also the credit risk. For the rest of variables size, liquidity and leverage they are not significant. According to fisher statistic, the model is accepted at level of significance equal to 5% while R square equals to 29%. **(See appendix 31)**

The results of estimations from the fixed effect model indicate that the variable size affect negatively net interest margin of banks at level of significance equals to 1% which means the larger the banks the less net interest margin this can be explained due to the growing number of investors and managers of banks and other parties which will affect badly on the performance of banks due to agency problems and the bad diversification policy in banks, while the variable liquidity has also a negative effect on net interest margin at the same level of significance. This result contradicts the theory and indicates that the risk of higher level or lower level of liquidity have a major negative impact on banks performance due to the risks of liquidity. For the variable credit risk, its effect remains the same as the previous model, while the other variables such as derivatives, leverage and loan are not significant. Moreover, the fixed effect model is accepted according to fisher statistic, and R square has improved to 71% which indicates that the independent variables explain 71% from the dependent variable which is a quite good percentage. **(See appendix 32)**

According to fisher statistic the DFE model is accepted at level of significance equal to 5%, while R square has risen to 72% indicating that the explaining level of independent variables to dependent variable has improved also comparing to the previous models. Additionally, observing the estimation results no changes in coefficients signs for all independent variables comparing to the fixed effect model. **(See appendix 33)**

From random effect model estimation results we conclude that the effect of the variables is the same like the previous model except for the variable liquidity which became not significant and the variable loan which became statically significant at level of significance equals to 1% with the same effect on net interest margin like in the PLS model. Additionally, the random effect model is accepted according to fisher statistic at level of significance equal to 5%, R square has decreased to 16%. **(See appendix 34)**

From Hausman test results we conclude that Chi square which equal to 39.707072 indicates that the studied variables have a fixed effect, as the probability is less than 5% we rejected the null hypothesis and accept the alternative hypothesis which says that the fixed effects models are most appropriate models. **(See appendix 35)**

I.2.7.2. Specification test results

I.2.7.2.A. Matrix of correlation

The correlations between variables of the second model are presented in the following matrix:

Table (3.45): Matrix of correlations (Net Interest Margin is the dependent variable)

	Derivatives	**Size**	**Leverage**	**Liquidity**	**Loan**	**Credit risk**	**Constant**
Derivatives	1.0000						
Size	-0.3056	1.0000					
Leverage	0.1037	-0.7768	1.0000				
Liquidity	-0.1080	0.3607	-0.1302	1.0000			

Loan	0.0284	-0.0670	0.1174	0.2646	1.0000		
Credit risk	0.0178	0.0209	0.0994	-0.1540	-0.0792	1.0000	
Constant	-0.1008	0.7689	-0.9999	0.1199	-0.1280	-0.1021	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.46): Multicollinearity test results of the second model

	VIF	**1/VIF**
Size	3.74	0.267369
Leverage	3.05	0.328082
Liquidity	1.42	0.704924
Derivatives	1.17	0.851428
Loan	1.11	0.897706
CreditR	1.10	0.906193
Mean VIF	1.93	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the coefficients are less than 5.

I.2.7.2.B. Heteroscedasticity test

The table (3.47) shows the absence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it was more than 5% which means we accept the null hypothesis and reject the alternative hypothesis confirming the homoskedasticity in our model. **(See appendix 36)**

Table (3.47): Breusch-Pagan Heteroskedasticity test results

Dependent variable	**Chi 2(1)**	**P -value**
NIM	3.18	0.0747

Source: by the author according to Stata16 results

In addition, we run also white test to test the heteroskedasticity of our model and the results were as follow:

Table (3.48): White test for Heteroskedasticity

Dependent variable	**Chi 2(27)**	**P -value**
NIM	38.43	0.0713

Source: by the author according to Stata16 results

Hence, according to the p value of white test we accept the null hypothesis and reject the alternative hypothesis confirming the absence of heteroskedasticity in our model. **(See appendix 37)**

I.2.7.2.C. Endogeneity test

The table (3.49) summarizes the results of the endogeneity of the second model where NIM is used as a measure for accounting performance of banks.

Table (3.49): Endogeneity test results (Net Interest Margin dependent variable)

Instruments		Chi-sq (1)	P-value
Included	Leverage, liquidity, loan, credit risk.	31.513	0.0000
Excluded	Size		
Included	Size, liquidity, loan, credit risk.	0.530	0.4665
Excluded	Leverage		
Included	Size, leverage, loan, credit risk	7.037	0.0080
Excluded	Liquidity		
Included	Size, leverage, liquidity, credit risk	2.018	0.1554
Excluded	Loan		
Included	Size, leverage, liquidity, loan	30.317	0.000
Excluded	Credit risk		

Source: by the author according to Stata 16 results

According to the results of the table (3.49), the p-value of the majority estimated regressions is less than 5% which means that there is no endogeneity problem in our model. **(See appendix 38)**

I.2.8. Summaries and Discussions

The aim of this part is to determine the effect of derivative instruments on net interest margin of banks from GCC countries.

Findings indicate that the derivatives instruments have no significant effect on net interest margin. Hence, the effect of derivatives on performance of banks is not clear.

In addition, bank size affects negatively the performance of banks. This finding is contrary to the theory stipulating that bank size influences positively bank performance. This finding implies that smaller banks have better performance than large banks which is relative to our sample banks.

The effect of the variable leverage on performance of banks is not comprehensible due to the insignificance of its coefficient.

Contrary to the literature results, the effect of liquidity levels on bank's performance is negative which mean that any increase in liquidity levels of the bank it leads to a decrease in the financial performance of banks. This result can be explained by the fact that managers of banks manage badly their levels of liquidity.

Finally, loan and credit risk affect positively the bank's performance. This can be interpreted by the fact that the higher level of loan and credit risk means that performance is positively affected especially considering credit risk and loan as proxies of risky asset which mean that banks manage well their risky assets.

As conclusion for this part, the effect of derivative instruments on bank performance is not clear.

The table (3.50) summarizes the main regression results of our model.

Table (3.50): NIM regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall
Derivatives	**-**	NS	NS	NS	NS
Size	NS	-	-	-	-
Leverage	NS	NS	NS	NS	NS
Liquidity	NS	-	-	NS	-
Loan	+	NS	NS	+	+
Credit risk	+	+	+	+	+

Source: by the author depending on Eviews 9 results

I.2.9. Regression analysis

I.2.9.1. Static Panel analysis

The estimation results of the second model where Cost to Income Ratio is a measure for the accounting performance of banks are summarized in the table (3.51).

Table (3.51): Estimation outputs of the second model (Cost to Income Ratio as the dependent variable)

Independent Variable	Method of estimation			
	PLS	FEM	DFE	REM
C	11146.728 (2.804911)***	-610.6983 (-1.875560)*	-649.7483 (-1.955085)*	-502.4698 (-1.618082)ns
Derivatives	153.2091 (2.452679)**	140.2282 (2.598873)***	163.5325 (2.885071)***	101.5876 (1.976604)**
Size	-5.834662 (-3.918438)***	8.537169 (3.004110)***	11.72448 (2.354671)**	-5.447840 (-3.024899)***
Leverage	-1061.842 (-2.563770)**	607.2110 (1.831294)*	629.8543 (1.866549)*	568.6022 (1.802539)*
Liquidity	-30.45060 (-3.447398)***	-1.918452 (-0.249895)ns	0.276813 (0.034720)ns	-19.98244 (-2.838409)***
Loan	-35.88327 (-5.785727)***	-1.355599 (-0.166733)ns	0.862780 (0.098478)ns	-4.012432 (-0.568457)ns
Credit risk	1.041492 (3.272503)***	0.226654 (1.014469)ns	0.159689 (0.632764)ns	0.488552 (2.278206)**
Log likelihood	-753.6362	-594.2955	-591.2027	-
S.E	7.679585	3.939502	3.980710	4.489506
R^2	0.415878	0.863689	0.867485	0.063885
F statistic	25.15636***	39.70648***	30.04583***	2.411298**
DW	0.395006	1.339280	1.327611	0.926589
No of Obs	219	219	219	219

Hausman test		
Dependent variable CIR	**Chi 2 (6)**	**Prob < Chi 2**
	69.471156	0.0000

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The PLS model is accepted statistically at level of significance equal to 5% according to fisher statistic, and the independent variables explain 41% of dependent variable as stated by R square. The coefficients indicate that derivatives have a positive effect on the performance measure cost to income ratio at level of significance equals to 5%, this effect shows that when using derivatives contract banks increase their cost to income ratio because these contracts are used for hedging purposes, by consequence banks manage their risks and therefore their performance increase. In contrast, the variables size, leverage, liquidity and loan had a negative effect on levels of cost to income ratio at level of significance equals to 5%. These results mean firstly for the variable size the more banks enlarge the less performance they achieve and this can be explained due to the growing number of investors and managers of banks and other parties which will affect the return of performance. In addition, the variable leverage also has a negative effect on cost to income ratio which means that the higher level of leverage decreases the performance of banks. While the variable liquidity has also the same negative effect indicating that the risks of higher level or lower level of liquidity have a major negative impact on banks performance. For the variable loan the positive effect reflect to the fact that banks are managing their loans properly by controlling their capital levels. Moreover, the variable credit risk has a positive effect on banks' performance improving that banks are hedging against this risk and controlling its negative effect. **(See appendix 39)**

About the independent variables coefficient signs in the fixed effect model, the effect of the variable derivatives did not change comparing to the previous model while the variables size and leverage have changed from a negative effect to a positive effect at level of significance equals to 1% and 10% respectively and this change is due to adding fixed effect to the model. These results can be explained for the variable size that the larger banks goes the more performance will achieve due to the good management and control of banks' activities. Moreover, same effect of the variable leverage on cost to income ratio. While the other variables such as liquidity, loan and credit risk are not significant. Moreover, the fixed effect model is accepted according to fisher statistic, and R square has improved to 86% which indicates that the independent variables explain 86% from the dependent variable. **(See appendix 40)**

According to fisher statistic the DFE model is accepted at level of significance equal to 5%, while R square is equal to 86%. Additionally, observing the estimation results no changes in coefficients signs for all independent variables comparing to the fixed effect model. **(See appendix 41)**

From random effect model estimation results we conclude that the effect of the variables is the same like the previous model except for the variables size and liquidity which became negatively correlated with the cost to income ratio at level of significance equals to 1% which is the same effect like in the PLS model. In addition to the variable credit risk which became statically significant at level of significance equals to 5% with the same effect on cost to income ratio like in the PLS model. Additionally, the random effect model is accepted according to fisher statistic at level of significance equal to 5% although R square has decreased to 6%. **(See appendix 42)**

From Hausman test results we conclude that Chi square which equal to 69.471156 indicate that the studied variables have a fixed effect, as the probability is less than 5% we rejected the null hypothesis and accept the alternative hypothesis which says that the fixed effects models are most appropriate models. **(See appendix 43)**

I.2.9.2. Specification test results

I.2.9.2.A. Matrix of correlation

The correlations between variables of the second model are exposed in the following matrix:

Table (3.52): Matrix of correlations (Cost to Income ratio is the dependent variable)

	Derivatives	Size	Leverage	Liquidity	Loan	Credit risk	Constant
Derivatives	1.0000						
Size	-0.3056	1.0000					
Leverage	0.1037	-0.7768	1.0000				
Liquidity	-0.1080	0.3607	-0.1302	1.0000			
Loan	0.0284	-0.0670	0.1174	0.2646	1.0000		
Credit risk	0.0178	0.0209	0.0994	-0.1540	-0.0792	1.0000	
Constant	-0.1008	0.7689	-0.9999	0.1199	-0.1280	-0.1021	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.53): Multicollinearity test results of the second model

	VIF	1/VIF
Size	3.74	0.267369
Leverage	3.05	0.328082
Liquidity	1.42	0.704924
Derivatives	1.17	0.851428
Loan	1.11	0.897706
CreditR	1.10	0.906193
Mean VIF	1.93	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the coefficients are less than 5.

I.2.9.2.B. Heteroscedasticity test

From the table (3.54), the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it was less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 44)**

Table (3.54): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P -value
CIR	93.18	0.0000

Source: by the author according to Stata16 results

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.55): White test results for Heteroskedasticity

Dependent variable	Chi 2(27)	P -value
CIR	135.71	0.0000

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the presence of heteroskedasticity in our model. **(See appendix 45)**

I.2.9.2.C. Endogeneity test

According to the table (3.56) results, the p-value of the majority estimated regressions is less than 5% which means that there is no endogeneity problem in our model. **(See appendix 46)**

Table (3.56): Endogeneity test results (Cost to Income Ratio dependent variable)

Instruments		Chi-sq (1)	P-value
Included	Leverage, liquidity, loan, credit risk.	8.886	0.0029
Excluded	Size		
Included	Size, liquidity, loan, credit risk.	3.400	0.0652
Excluded	Leverage		
Included	Size, leverage, loan, credit risk	0.064	0.7996
Excluded	Liquidity		
Included	Size, leverage, liquidity, credit risk	0.029	0.8655
Excluded	Loan		
Included	Size, leverage, liquidity, loan	3.886	0.0487
Excluded	Credit risk		

Source: by the author according to Stata 16 results

I.2.10. Summaries and Discussions

From this part we aimed to determine the effect of derivative instruments on cost to income ratio of banks from GCC countries.

Findings indicate that the derivatives instruments have positive effect on cost to income ratio. This finding is in line with literature results showing an increase of performance by using derivative instruments although the majority of previous studies are focusing in banks from developed countries. Thus, we can say that our sample of banks use well derivatives contracts to hedge their risk even though they have used derivatives recently and that their derivatives markets are small comparing to banks from developed countries.

In addition, bank size affects positively the performance of banks. This result support the theory stipulating that large banks have better diversified asset portfolio, thus becoming more efficient.

The effect of the variable loan on performance of banks is not comprehensible due to the insignificance of its coefficient.

Contrary to the literature results, the effect of liquidity levels on bank's performance is negative which mean that any increase in liquidity levels of the bank it leads to a decrease in the financial performance of banks. This result can be explained by the fact that managers of banks manage badly their levels of liquidity.

Finally, leverage and credit risk affect positively the bank's performance. This can be interpreted by the fact that the higher level of leverage and credit risk means that performance is positively affected especially considering credit risk as proxy of risky asset and the complexity of leverage management improving that banks are managing well their risky assets.

As conclusion for this part, the effect of derivative instruments on bank performance is positive.

In summary, the main results of the second section indicate that banks tend to decrease their performance by using derivative instruments. This result rejects literature findings and the argument stipulating that derivatives use increases bank performance. It appears that banks use badly derivative instruments to hedge their risk, and these instruments are used for speculation purpose which explains its negative impact on performance.

The following table presents a summary of the main regression results of our model.

Table (3.57): CIR regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall
Derivatives	+	+	+	+	+
Size	-	+	+	-	+/-
Leverage	-	+	+	+	+
Liquidity	-	NS	NS	-	-
Loan	-	NS	NS	NS	NS
Credit risk	+	NS	NS	+	+

Source: by the author depending on Eviews 9 results

Section II. The effect of financial derivatives on banks' risks

The current section aims to analyze empirically how financial derivatives affect both the capital market and accounting risks of banks. At the beginning we will measure the capital market risks of banks using stock returns of each banks individually following (Mohamed keffala et al., 2012); (Rodriguez-Moreno et al., 2013); (Banerjee et al., 2017) and (Huan & Parbonetti, 2019). After that, we will use the accounting measures of risks such as leverage risk, liquidity and credit risks following literature (Mohamed Keffala & de Peretti, 2013); (S. Li & Marinč, 2014b) and (Kornel, 2014).

II.1. The effect of financial derivatives on capital market risk of banks

This part of analysis has the aim to examine the effect of derivative instruments on banks' capital market risk. To achieve this end, this part is organized as follow: Data and sample are described, as well as the methodology in first place then estimation results and analysis and lastly summaries and discussions are provided.

II.1.1. Data, sample and methodology

II.1.1.1. Data

In order to obtain the volatility of each bank stock returns, daily stock prices for each bank were collected from Thomson Reuter's database. In addition, market indices of each country were obtained from their stock exchange websites to calculate market return.

Hence, we calculated the volatility of stock returns using the same equation as in the first section. Moreover, in order to calculate the market risk β of each bank, we used the following formula:

$$\beta_{m,i} = \frac{cov\ (R_{i,t}, R_{m,t})}{var(R_{m,t})} \ldots equation\ (2)$$

Furthermore, annual accounting data of each bank were also used in our model as independent variables obtained from Bank Focus data base during the period 2006-2018.

II.1.1.2. Sample

Our sample is composed of 25 banks from GCC countries as described in the first part. (for more details see table (3.1)).

II.1.1.3. Methodology

We start with the presentation of the variables used in our model and their definitions. After that, we test our second hypothesis and the expected results comparing to the literature results.

II.1.1.3.A. Variables description

In order to obtain the three capital market risk measures which are the systematic risk, the specific risk and the total risk, we used the market model the Capital Asset Pricing Model (CAPM) for each bank following this equation:

$$R_{it} = \alpha_{mi} + \beta_{mi} R_{mt} + \varepsilon_{it} \dots equation\ (3)$$

Where:
R_{it}: represent the stock return of bank I in period t.
R_{mt}: is the market return based on a weighted portfolio of common stocks.
ε_{it}: is the error term.

After the estimation, we obtained:

- ✓ The measure of the total risk for each bank by calculating the standard deviation of R_{it}.
- ✓ The measure of the systematic risk for each bank represented in parameter β_{mi}.
- ✓ The measure of the specific risk for each bank by calculating the standard deviation of ε_{it}.

Hence, the following table represents both dependent and independent variables in this analysis.

Table (3.58): Variables definition

Variables	Proxy	Definition	References
Dependent variable			
Total risk (σR_{it})	Capital Market Risk	The annualized standard deviation of the banks' daily stock return	Chaudhry et al (2000); Keffala (2012); (Banerjee et al., 2017).
Systematic risk (β_{mi})		The beta of banks' stock returns	Chaudhry et al (2000); Keffala (2012); (Rodriguez-Moreno et al., 2013); (Banerjee et al., 2017).
Specific risk ($\sigma\varepsilon_{it}$)		The annualized standard deviation of residual errors from the market model	Chaudhry et al (2000); Keffala (2012); (Banerjee et al., 2017).
Independent variables			
Derivatives	Derivatives	The notional value of derivatives divided by total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Size	Bank size	Natural log of total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
NIM	Net interest margin	The difference between total interest income and total interest expense expressed as a percentage of total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Liquidity	Liquidity	The ratio of liquid assets equity to total assets.	Chaudhry et al (2000); Reichert and Shyu (2003); keffala (2012)

Loan	Loan	The ratio of gross loans to total assets	Chaudhry et al (2000); Rivas et al (2006); Yong et al (2009); Keffala (2012)
Credit risk	Credit risk	The ratio of loan loss-reserves to gross loans.	Chaudhry et al (2000); Reichert and Shyu (2003).

Source: by the author depending on literature review

From the table (3.58), the dependent variable is divided to three measures as proxies for bank capital market risk. We have total risk, systematic risk and specific risk as described earlier. For the independent variables, we have derivative instruments, bank size, net ineterst margin, liquidity, loan and credit risk. The choice of these variables is according to previous studies and literature as described in the previous table.

II.1.1.3.B. Testing hypotheses and expected results

Previous studies results show that the effect of the derivative instruments on bank risk is negative (Chaudhry et al 2000; Reicchert and Shyu 2003; Keffala 2012). Hence, our second hypothesis stipulates that the effect of derivative instruments is negative on banks' risks.

For variable bank size according to literature and the theory it is known that large banks are riskier than small banks (Chaudhry et al 2000; Reichert and Shyu 2003; Keffala 2012). Hence, a positive relation between bank risks and bank size is predicted. In addition (Chaudhry et al 2000; Reicchert and Shyu 2003; Keffala 2012)) conducted that the variable loan is considered as risky asset and have a negative effect on risks of banks. Moreover, according to literature (Chaudhry et al 2000; Reicchert and Shyu 2003) liquidity affect negatively capital market risks, so we conduct a negative relationship between the variable liquidity and bank risks. Furthermore, the effect of net interest margin on bank risk is expected to be positive following literature (Chaudhry et al 2000, Reicchert and Shyu 2003). Lastly, the variable credit risk expected effect on banks risks is negative (Keffala 2012).

The table (3.59) provides the predicted effect of the independent variables and their references.

Table (3.59): The predicted relationship between dependent variable and independent variables

Variables	Expected sign	References
Derivatives	-	(Chaudhry et al 2000, Reicchert and Shyu 2003)
Size	+	(Chaudhry et al 2000, Reicchert and Shyu 2003)
NIM	+	(Chaudhry et al 2000, Reicchert and Shyu 2003)
Liquidity	-	(Chaudhry et al 2000, Reicchert and Shyu 2003)
Loan	-	(Chaudhry et al 2000, Reicchert and Shyu 2003)
Credit risk	-	Keffala (2012)

Source: by the author depending on literature review results

II.1.2. Empirical analysis

First, the empirical model is represented then unit root test results and descriptive statistics are provided.

II.1.2.1. Empirical model

The equation below represents the conceptual model of the first part of this section which describes the effect of derivatives on capital market risk of banks.

Third model:

$$Capital\ market\ risk_{i,t} = \alpha_0 + \alpha_1 Derivatives_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 NIM_{i,t} + \alpha_4 Liquidity_{i,t} + \alpha_5 Loan_{i,t} + \alpha_6 Credit\ risk_{i,t} + \varepsilon_{it}$$

Where:
Capital market risk is divided to total risk, systematic risk and specific risk in each regression.
ε_{it}: is the random error.
The other variables are defined previously.

II.1.2.2. Unit root test

The table (3.60) shows that the stationarity of the variables is checked using several tests. Trying with individual intercept, then individual intercept and trend and finally without individual intercept and trend. The results are as follow:

Table (3.60): Stationarity test results

Variables	LLC	IPS	ADF	PP	Decision
Total risk	-26.3883 (0.0000)	-7.94070 (0.0000)	123.313 (0.0000)	155.536 (0.0000)	Stationary at level
Systematic risk	-12.0580 (0.0000)	-4.16221 (0.0000)	107.390 (0.0000)	146.348 (0.0000)	Stationary at level
Specific risk	-6.82531 (0.0000)	-2.98218 (0.0014)	95.0818 (0.0001)	148.805 (0.0000)	Stationary at level
Derivatives	-63.0980 (0.0000)	-12.1034 (0.0000)	82.7248 (0.0025)	78.7588 (0.0058)	Stationary at level
Size	-37.6437 (0.0000)	-15.4769 (0.0000)	99.9018 (0.0000)	115.241 (0.0000)	Stationary at level
NIM	-11.5902 (0.0000)	-6.03045 (0.0000)	133.797 (0.0000)	156.317 (0.0000)	Stationary at level
Liquidity	-3.03821 (0.0012)	-3.33152 (0.0004)	89.4603 (0.003)	109.291 (0.0000)	Stationary at level
Loan	-29.1801 (0.0000)	-10.9453 (0.0000)	148.590 (0.0000)	160.342 (0.0000)	Stationary at level
Credit risk	-8.49817 (0.0000)	-3.90960 (0.0000)	94.4634 (0.0001)	71.5909 (0.0242)	Stationary at level

Source: by the author depending on Eviews 9 results

According to the table results, the stationarity of all variables is checked since the P value of the majority of tests is closed to 0, which means we reject the null hypothesis of Unit Root at 5 % significance level.

II.1.2.3. Descriptive statistics

The tables below describe the statistical variables used in the model divided according to our sample countries.

Table (3.61): Panel A. descriptive statistics of variables from UAE

UAE

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0085	0,0069	0,0276	0,0001	0,0085	0,7768	2,3887	3,4843
SIZE	5,0697	4,9894	5,6091	4,5825	0,3123	0,1107	1,9212	1,5160
NIM	3,3457	3,1800	4,4400	2,4000	0,5527	0,6431	2,3553	2,5876
LIQUIDITY	0,1651	0,1435	0,3268	0,0805	0,0654	1,1621	3,3801	6,9333
CREDIT_RISK	5,5157	5,0950	8,7100	2,0500	1,7830	0,1954	2,0894	1,2275
LOAN	0,6938	0,7179	0,7669	0,5093	0,0748	-1,3694	3,4916	9,6783
TOTAL_RISK	0,7907	0,4453	4,6294	0,1933	0,9665	2,8655	10,5662	112,6152
SYSTEMATIC_RISK	0,3721	0,2729	1,9878	0,0656	0,3676	3,2535	14,1655	208,7619
SPECIFIC_RISK	0,6623	0,3260	4,1809	0,1594	0,9212	2,7246	9,5620	90,9415

Source: by the author depending on Eviews 9 results

According to Jarque-Bera, all variables are normally distributed in UAE except for liquidity, loan and total risk, systematic and specific risk, while Skewness is ranging from -1.36 to 3.25 and Kurtosis is also ranging from 1.92 to 14.16. For the variable derivatives 'average is 0.0085 with a maximum of 0.02 and standard deviation of 0.0085. In addition, the variable size has a maximum of 5.60 and standard deviation of 0.31 with an average of 5.06; while net interest margin has a maximum of 4.44 and a standard deviation of 0.55. Moreover, the variable liquidity has an average of 0.16 and maximum value of 0.32 with a standard deviation of 0.06. Furthermore, the variable credit risk has a standard deviation of 1.78 and maximum value of 8.71, while loan has an average of 0.69 with a standard deviation of 0.07. Finally, total risk, systematic and specific risk have a maximum value of 4.62, 1.98 and 4.18 respectively.

Table (3.62): Panel B. descriptive statistics of variables from Bahrain

Bahrain

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0046	0,0034	0,0211	0,0002	0,0046	1,7711	6,5997	32,9433
SIZE	4,2495	4,3939	6,5755	3,2289	0,7736	1,3594	5,9007	21,0746
NIM	2,2597	2,3450	3,1300	1,1300	0,5148	-0,3775	2,4019	1,2371
LIQUIDITY	0,1898	0,1928	0,3454	0,0000	0,0742	-0,6783	3,8828	3,4932
CREDIT_RISK	3,9457	3,9050	6,9000	1,3900	1,2763	0,2143	3,3176	0,3557
LOAN	0,4953	0,5403	0,6502	0,0000	0,1427	-2,6640	9,7828	99,1933
TOTAL_RISK	1,4332	0,3487	7,4920	0,1468	2,0601	1,6161	4,3023	13,6615
SYSTEMATIC_RISK	0,5631	0,2044	3,7720	0,0034	0,9305	2,5609	8,6388	65,2820

SPECIFIC_RISK	1,2492	0,3245	6,7375	0,1276	1,8872	1,7073	4,5503	15,8202

Source: by the author depending on Eviews 9 results

In Bahrain, the results show that all variables are normally distributed according to Jarque-Bera probability while Skewness ranges from –2.66 to 2.56 and Kurtosis also ranges from 2.40 to 9.78. Derivatives in Bahrain have an average of 0.0046 with a maximum value of 0.0211 and a standard deviation of 0.0046. For the variable size it has an average of 4.24 and standard deviation of 0.77 while maximum value is equal to 6.57. In addition, net interest margin has a maximum of 4.44 with standard deviation of 8.89. Moreover, the maximum value of liquidity is equal to 0.18 while its standard deviation is 0.07. However, the variable credit risk has a maximum value of 6.90 and a standard deviation of 1.27. For loan the standard deviation is equal to 0.14 while its average is 0.49. Lastly, total risk, systematic and specific risk have a maximum of 7.49, 3.77 and 6.73 respectively.

Table (3.63): Panel C. descriptive statistics of variables from Kuwait

Kuwait

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0003	0,0002	0,0008	0,0000	0,0003	0,2922	1,3065	1,4711
SIZE	3,8373	3,5915	4,3729	3,3899	0,4194	0,1863	1,1817	1,5790
NIM	3,1109	3,1000	3,5300	2,8400	0,2508	0,6229	2,0062	1,1641
LIQUIDITY	0,2390	0,2410	0,3338	0,1555	0,0541	0,0385	2,1335	0,3468
CREDIT_RISK	3,9200	3,9100	4,3500	3,3000	0,3740	-0,3476	1,7586	0,9278
LOAN	0,6504	0,6422	0,7144	0,5703	0,0508	-0,0841	1,6002	0,9111
TOTAL_RISK	0,2290	0,1541	0,4798	0,1083	0,1314	0,9492	2,5226	1,7564
SYSTEMATIC_RISK	0,0810	0,0627	0,2067	0,0005	0,0560	0,9752	3,5276	1,8712
SPECIFIC_RISK	0,2052	0,1346	0,4798	0,0883	0,1353	1,2451	3,0076	2,8420

Source: by the author depending on Eviews 9 results

In Kuwait all variables are normally distributed according to Jarque-Bera results and Skewness ranges from -0.34 to 1.24 while Kurtosis ranges from 1.18 to 3.52. The average of derivatives is 0.003 with a maximum of 0.008 and standard deviation of 0.003. For the variable size the maximum value is 4.37 while the standard deviation is equal to 0.41 with an average of 3.83. In addition, net interest margin has a maximum value of 3.53 and a standard deviation of 0.25. For the variable liquidity its average is 0.23 and standard deviation of 0.05. Moreover, credit risk has a maximum of 4.35 with a standard deviation of 0.37, while loan has an average of 0.65. The maximum value of total risk, systematic and specific risk is 0.47, 0.20 and 0.47 respectively.

Table (3.64): Panel D. descriptive statistics of variables from Qatar

Qatar

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0017	0,0006	0,0098	0,0000	0,0022	2,0455	7,1962	41,5007
SIZE	4,8713	4,7960	5,7313	4,2534	0,4335	0,5973	2,4120	2,1420
NIM	2,8366	2,9200	3,8000	1,7000	0,5386	-0,7449	2,9181	2,6901
LIQUIDITY	0,1360	0,1374	0,2668	0,0559	0,0498	0,6349	3,3913	2,1330
CREDIT_RISK	2,1110	2,0100	3,6400	0,6600	0,8383	0,1711	2,0279	1,2834
LOAN	0,6266	0,6398	0,7562	0,3942	0,0849	-1,0353	3,9250	6,2147

TOTAL_RISK	0,3961	0,3211	1,2880	0,0779	0,2766	2,0448	6,4790	34,8349
SYSTEMATIC_RISK	0,1810	0,2039	0,3106	0,0031	0,0926	-0,4872	2,1511	2,0180
SPECIFIC_RISK	0,3325	0,2425	1,2615	0,0550	0,2864	2,1716	6,6961	39,3011

Source: by the author depending on Eviews 9 results

According to The results, Jarque-Bera indicates that all variables are normally distributed except for derivatives, loan and both total and specific risks in Qatar. As for Skewness it is ranging from -1.03 to 2.17 and Kurtosis is also ranging from 2.02 to 7.19. Concerning the variable derivatives in Qatar it has an average of 0.0017 with a maximum of 0.0098 and a standard deviation of 0.0022; while the variable size standard deviation is equal to 0.43 with a maximum of 5.7 and an average of 4.87. Moreover, net interest margin, it has a standard deviation equals to 0.53 and a maximum of 3.80. Furthermore, liquidity maximum value is equal to 0.26 and a standard deviation of 0.04 while average is equal to 0.13; credit risk has a maximum of 3.64 and a standard deviation of 0.83 while loan standard deviation is 0.08 and a maximum of 0.75 while its average is 0.62. For total risk, systematic and specific risk their maximum value is 1.28, 0.31 and 1.26 respectively.

Table (3.65): Panel E. descriptive statistics of variables from Saudi Arabia

Saudi Arabia

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0113	0,0118	0,0345	0,0009	0,0097	0,7439	2,6133	3,5443
SIZE	5,1664	5,2311	5,3715	4,7117	0,1732	-1,3287	4,0145	12,1370
NIM	2,5967	2,5950	3,0500	1,9300	0,2522	-0,6369	3,5405	2,8720
LIQUIDITY	0,1123	0,1002	0,2200	0,0587	0,0361	0,8010	3,3623	4,0464
CREDIT_RISK	2,4769	2,1100	7,6500	1,3000	1,3073	2,3649	9,0555	88,5601
LOAN	0,6200	0,6303	0,6919	0,4480	0,0528	-1,4614	5,3260	20,9292
TOTAL_RISK	0,3024	0,3055	0,5248	0,1174	0,0940	0,1592	2,5219	0,4951
SYSTEMATIC_RISK	0,2146	0,2314	0,4033	0,0141	0,1004	-0,2196	2,2500	1,1332
SPECIFIC_RISK	0,2014	0,1936	0,3983	0,1049	0,0608	0,8701	4,4567	7,7252

Source: by the author depending on Eviews 9 results

For Saudi Arabia results the variables are normally distributed according to Jarque-Bera except for size, credit risk, loan and specific risk. Skewness ranges from -1.46 to 2.36 while Kurtosis ranges also from 2.25 to 9.05. The average of derivatives in Saudi Arabia banks is equal to 0.0113 with a maximum of 0.0345 and a standard deviation of 0.0097; for size the average is 5.16 with a standard deviation of 0.17 and a maximum of 5.37. Moreover, net interest margin is 3.05 with a standard deviation of 0.25; while liquidity standard deviation is 0.03 and maximum of 0.22 with an average of 0.11. Moreover, credit risk maximum value is 7.65 with a standard deviation of 1.30; loan average is 0.62. For total risk, systematic and specific risk their maximum value is respectively 0.52, 0.40 and 0.39.

Table (3.66): Panel F. descriptive statistics of variables from Oman

Oman

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0020	0,0017	0,0067	0,0000	0,0019	0,8872	3,0068	2,4927
SIZE	3,5084	3,4045	4,0985	2,9868	0,3199	0,4095	2,0376	1,2643
NIM	3,1374	3,2100	3,9100	2,3500	0,4676	-0,0981	1,9581	0,8898

LIQUIDITY	0,1828	0,1708	0,2754	0,1262	0,0431	0,5930	2,3237	1,4757
CREDIT_RISK	3,4642	3,4200	4,7400	2,2800	0,6486	0,3406	2,3589	0,6928
LOAN	0,6794	0,7168	0,8017	0,4792	0,1095	-0,7164	2,0382	2,3576
TOTAL_RISK	0,3148	0,3296	0,5158	0,1324	0,1026	0,0845	2,1442	0,6024
SYSTEMATIC_RISK	0,1706	0,1147	0,4631	0,0021	0,1320	0,7260	2,4318	1,9245
SPECIFIC_RISK	0,2425	0,2353	0,3604	0,1257	0,0698	0,1824	2,3658	0,4238

Source: by the author depending on Eviews 9 results

Oman results indicate that all variables were normally distributed according to Jarque-Bera and Skewness ranges from –0.71 to 0.88 while Kurtosis ranges from 1.95 to 3.00. For the variable derivatives maximum value is 0.0067 with an average of 0.0020 and a standard deviation of 0.0019. Concerning the variable size' average is 3.50 with a maximum of 4.09 and a standard deviation of 0.31. Additionally, net interest margin maximum value are 85.02 and 3.91 respectively. For liquidity the average is equal to 0.18 with a standard deviation of 0.04 and a maximum value of 0.27. In addition, credit risk maximum value is 4.74 with a standard deviation of 0.64. The average of loan is 0.67, while total risk, systematic and specific risks maximum value is 0.51, 0.46 and 0.36 respectively.

As a conclusion, UAE banks are the most users of derivative instruments in GCC countries with a standard deviation of 0.0085. Moreover, the Saudi Arabian banks are the larger banks while the smallest banks are Kuwait banks. As for net interest margin the highest scores are in UAE banks followed by Oman, Qatar, Kuwait, Bahrain and lastly Saudi Arabia where the standard deviation in UAE is the highest with a score of 0.5527 and the lowest standard deviation is in Kuwait, the high liquidity levels is in Kuwait banks followed by Oman, Bahrain, UAE, Qatar and lastly Saudi Arabia, for the standard deviation which is a measure of risk the highest level is in Bahrain and the lowest in Saudi Arabia. In addition, UAE banks have the highest level of credit risk followed by Saudi Arabia, Bahrain, Oman, Kuwait and lastly Qatar, while the standard deviation high level is in UAE and the lowest is in Kuwait. The highest level of loan is in UAE followed by Oman, Kuwait, Qatar, Saudi Arabia and Bahrain with Bahrain and Oman as it have the highest level of standard deviation while Kuwait and Saudi Arabia have the lowest level of Standard deviation. Finally, the highest level of total risk is in Bahrain banks followed by UAE, Qatar, Saudi Arabia, Oman and lastly Kuwait. For the systematic risk, the highest level is in Bahrain, UAE, Oman, Saudi Arabia, Qatar and Kuwait, while the specific risk level is high in Bahrain banks followed by UAE, Qatar, Kuwait, Saudi Arabia and lastly Oman.

II.1.3. Regression analysis

II.1.3.1. Static Panel analysis

The estimation results of the third model are summarized in table (3.67) where total risk is a measure for capital market risk

Table (3.67): Estimation outputs of the third model (Total risk as the dependent variable)

Independent Variable	Method of estimation			
	PLS	**FEM**	**DFE**	**REM**
C	0.206246 (0.234280)^{ns}	16.37774 (4.250800)***	6.250651 (1.080383)^{ns}	2.856658 (2.010538)**

Derivatives	6.902450 (0.655201)ns	-24.10013 (-1.765759)*	-31.64390 (-2.244541)**	-7.089276 (-0.609592)ns
Size	0.206695 (1.647357)ns	-2.547962 (-3.431967)***	-0.392786 (-0.333300)ns	-0.063774 (-0.305080)ns
NIM	-0.592946 (-3.285599)***	-0.894622 (-4.333232)***	-0.778592 (-3.732140)***	-0.529052 (-3.258224)***
Liquidity	6.977961 (4.921091)***	-1.827259 (-1.005230)ns	-3.375560 (-1.773178)*	1.695853 (1.115801)ns
Loan	-0.730243 (-0.680327)ns	-1.987071 (-1.106607)ns	-1.851583 (-1.038909)ns	-1.612278 (-1.278621)ns
Credit risk	0.131669 (2.808315)***	0.085943 (1.528902)ns	0.087206 (1.561673)ns	0.097636 (1.958682)*
Log likelihood	-175.7749	-94.11611	-89.03200	-
S.E	0.855721	0.530996	0.524265	0.562290
R^2	0.312815	0.782439	0.797473	0.119003
F statistic	10.24226***	13.30670***	11.92534***	3.039243***
DW	0.860165	2.150459	2.212072	1.655208
No of Obs	142	142	142	142
Hausman test				
Dependent variable total risk	**Chi 2 (6)**		**Prob < Chi 2**	
	23.056018		0.0008	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The PLS model is accepted statistically at level of significance equal to 5% according the fisher statistic and R square equals to 31% meaning that the independent variable explained 31% of the dependent variable. The results show that Derivatives size and loan effect on total risk is not significant, while NIM is correlated negatively with total risk at level of significance equal to 1%, which revealed that the accounting performance of banks presented in the indicator NIM decreases total risk of banks in financial markets. However, liquidity affects positively total risk at level of significance equals to 1%, indicating that banks' level of liquidity increases liquidity risk ok the banks. In addition, credit risk is positively correlated with total risk at level of significance equals to 1%. This result shows that the increase in credit risk of banks will increase total risk of banks. **(See appendix 47)**

According to fisher statistic the fixed model is accepted at level of significance equals to 5%, and R square has improved comparing to the previous model to 78%. About the estimation results, coefficients signs show that derivatives effect on total risk is negative and statically accepted at 10%. This result means that banks that use derivatives instruments reduce their total risk because their use is for hedging purposes. Moreover, the bank size has a negative effect on total return which reveals that the large banks have less total risk comparing to small banks. The effect of the variable NIM remains the same comparing to the previous model at the same level of significance. While the other variables liquidity, loan and credit risk are not significant. **(See appendix 48)**

The effect of derivatives remains the same in the DFE model comparing to the previous model at 5% level of significance, while only the variable size becomes insignificant. For the variable NIM a negative effect is detected on the total risk at level of significance equals to 1% like previous models, while the effect of liquidity becomes negative at significant at 10% which means that higher level of liquidity lead to a decrease in total risk. Moreover, both loan and credit risks are not significant. According to fisher statistic the model is accepted at 5% level of significance with R square equals to 79%. **(See appendix 49)**

Although the decrease in R square to 11% in the random effect model it is statistically accepted at level of significance equal to 5%. The effect of financial derivatives, size liquidity and loan is insignificant. While, the effect NIM and credit risk is the same comparing to PLS model and their effect is statically significant at 1%. **(See appendix 50)**

From Hausman test, Chi square equals to 23.05 for the dependent variable total risk indicating that the studied variables have a fixed effect, as the probability is less than 5% we reject the null hypothesis which says that the random effects models are the appropriate models and accept the alternative hypothesis stipulating that the fixed effects models are the most appropriate model. **(See appendix 51)**

II.1.3.2. Specifications tests results

II.1.3.2.A. Matrix of correlation

The correlations between variables of the model are resented in the following matrix:

Table (3.68): Matrix of correlations (Total risk is the dependent variable)

	Derivatives	Size	NIM	Liquidty	Loan	CreditR	Constant
Derivatives	1.0000						
Size	-0.4251	1.0000					
NIM	0.1542	-0.0335	1.0000				
Liquidity	-0.0972	0.3826	-0.2408	1.0000			
Loan	0.0438	-0.0269	-0.5696	0.3139	1.0000		
CreditR	-0.0654	0.0117	-0.3195	-0.2408	0.0517	1.0000	
Constant	0.1212	-0.6888	-0.0165	-0.5554	-0.5148	0.0186	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.69): Multicollinearity test results of the third model

	VIF	1/VIF
NIM	1.85	0.541693
Loan	1.63	0.612477
Liquidity	1.54	0.649774
Size	1.50	0.668749
Credit risk	1.31	0.766005
Derivatives	1.29	0.774020
Mean VIF	1.52	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

II.1.3.2.B. Heteroscedasticity test

The results of table (3.70) show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 52)**

Table (3.70): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P -value
Total risk	189.71	0.0000

Source: by the author according to Stata16 results

We run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.71): White test results for Heteroskedasticity

Dependent variable	Chi 2(27)	P -value
Total risk	80.79	0.0000

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 53)**

II.1.3.2.C. Endogeneity test

The following table provides the results of endogeneity test of the third model.

Table (3.72): Endogeneity test results (Total risk as the dependent variable)

<table>
<tr><th colspan="2">Instruments</th><th>Chi-sq (1)</th><th>P-value</th></tr>
<tr><td>Included</td><td>NIM, liquidity, loan, credit risk.</td><td rowspan="2">11.224</td><td rowspan="2">0.0008</td></tr>
<tr><td>Excluded</td><td>Size</td></tr>
<tr><td>Included</td><td>Size, Liquidity, loan, credit risk.</td><td rowspan="2">16.928</td><td rowspan="2">0.0000</td></tr>
<tr><td>Excluded</td><td>NIM</td></tr>
<tr><td>Included</td><td>Size, NIM, Loan, credit risk</td><td rowspan="2">1.055</td><td rowspan="2">0.3042</td></tr>
<tr><td>Excluded</td><td>Liquidity</td></tr>
<tr><td>Included</td><td>Size, NIM, liquidity, credit risk</td><td rowspan="2">1.277</td><td rowspan="2">0.2585</td></tr>
<tr><td>Excluded</td><td>Loan</td></tr>
<tr><td>Included</td><td>Size, NIM, liquidity, loan</td><td rowspan="2">2.413</td><td rowspan="2">0.1203</td></tr>
<tr><td>Excluded</td><td>Credit risk</td></tr>
</table>

Source: by the author according to Stata 16 results

According to the table (3.72) ‘results, the p-value of the majority estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. Hence, we should run a GMM model. **(For more details see appendix 54)**

In our study **t**he number of banks (groups) is greater than the number of the time period and the third model of our analysis suffer from the existence of heteroskedasticity and endogeneity problem. Hence, it is appropriate to use GMM estimator in order to have w better results of our regression.

II.1.3.3. GMM Panel analysis

The table (3.73) shows the estimation results of the third model using GMM estimator.

Table (3.73): Estimation outputs using GMM of the third model (Total risk as the dependent variable)

Variables	Total risk
Total risk (-1)	-0.029499 (-1.963518)*
Derivatives	-14.79577 (-2.593830)**
Size	-3.665422 (-8.449608)***
NIM	-0.773606 (-10.68536)***
Liquidity	-0.807189 (-1.157206)ns
Loan	-0.353676 (-0.398049)ns
Credit risk	0.085216 (2.080827)**
Num of Obs	98
Hansen test (J-statistic)	17.28021
P-value of Hansen test	0.054505
Arrellano & Bond test AR (1)	-1.470675
P-value of AR (1)	0.1414
Arrellano & Bond test AR (2)	-1.313132
P-value of AR (2)	0.1891

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

Since the p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 55 and 56)**

Moreover, the coefficients indicated that total risk lagged value is significant which confirms the validation of GMM model. For Derivative instruments it has a negative effect on total risk of banks at level of significance equals to 5%.

As concerning the variables size, net interest margin they affect negatively the total risk of banks at level of significance equals to 1%. While, credit risk results show that its effect on total risk is positive. For the variables liquidity and loan their effect on banks total risk is not evident due to its insignificance.

II.1.4. Summaries and Discussions

This analysis aims to determine the impact of derivative instruments on total risk of banks from GCC countries.

From the static panel findings indicate that the derivatives instruments have a negative significant effect on banks' total risk. This finding corroborates the theory stipulating that using derivatives instruments reduce risk in banks. It can be interpreted by the fact that our sample banks are using financial derivatives for hedging purposes. Hence, derivatives are hedging tools which are useful to decrease total risks of banks.

In addition, the effect of bank size is not clear on the total risk of banks. This finding cannot corroborate the theory stipulating that bank size increases total risk of banks meaning that larger banks are more risky than small banks

For the variable net interest margin, the association with total risk of banks was negative contrary to what it was expected comparing to literature results.

Finally, the effect of credit risk on total risk of banks is positive which means that any increase in credit risk of the bank it leads to an increase in the total risks of banks.

For the other variables liquidity and loan their effect cannot be comprehensible because of the insignificance of their coefficient.

Moreover, the result of GMM estimation shows that effect of derivative instruments on total risk of banks is negative, this result is in line with the literature and it can be interpreted that banks of our sample use well derivatives contracts to hedge their risk. The majority of the previous studies are focusing on banks from developed countries, we can say that our study the banks sample is from emerging countries which they manage the use of derivatives and hedge their risks. Although, they do not have a long experience in using such instruments comparing to advanced countries and they have used derivatives recently additionally their derivatives markets are small, our sample banks are hedging their total risks.

As concerning the bank size its negative effect on total risk of banks. This finding does not support the theory stipulating that the size of banks influences positively banks total risks. The theory suggests that large banks are riskier than small banks. For net interest margin it also affects negatively the total risks of banks.

Finally, the effect of credit risk is positive as predicted, which means that the increase in credit risk of banks will automatically increases their total risks. The effect of liquidity and loan is not clear at level of significance equals to 5%. Consequently, it appears that the literature results stipulating the liquidity and loan have a negative effect on bank risk is rejected.

In summary, the evidence suggests that banks seem to decrease their total risk by using derivative instruments. Indeed, deducing results are similar to literature findings and the argument that stipulate that derivatives usage reduce total risks of banks. Hence, our hypothesis is accepted.

The table below summarizes the main regression results of our model.

Table (3.74): Total risk Regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	-	-	NS	-	-
Size	NS	-	NS	NS	NS	-
NIM	-	-	-	-	-	-
Liquidity	+	NS	-	NS	NS	NS
Loan	NS	NS	NS	NS	NS	NS
credit risk	+	NS	NS	+	+	+

Source: by the author depending on Eviews 9 results

II.1.5. Regression analysis

II.1.5.1. Static Panel analysis

The next table represents the estimation results of the third model where systematic risk is used as a measure for capital market risk.

Table (3.75): Estimation outputs of the third model (Systematic risk as the dependent variable)

Independent Variable	Method of estimation			
	PLS	**FEM**	**DFE**	**REM**
C	-0.124784 (-0.289359)ns	3.414422 (1.376778)ns	1.098420 (0.290908)ns	0.149107 (0.229186)ns
Derivatives	4.847466 (0.939321)ns	-7.095663 (-0.807672)ns	-10.29386 (-1.118795)ns	1.453513 (0.224545)ns
Size	0.112162 (1.824873)*	-0.587221 (-1.228801)ns	-0.085137 (-0.110696)ns	0.074280 (0.805716)ns
NIM	-0.271643 (-3.072744)***	-0.239507 (-1.802271)*	-0.205531 (-1.509592)ns	-0.211585 (-2.227921)**
Liquidity	2.657694 (3.826184)***	0.225530 (0.192752)ns	-0.202158 (-0.162716)ns	1.521698 (1.792269)*
Loan	0.073409 (0.139613)ns	0.386573 (0.334458)ns	0.355865 (0.305953)ns	0.055425 (0.084633)ns
Credit risk	0.051000 (2.220537)**	0.012580 (0.347694)ns	0.011603 (0.318377)ns	0.032875 (1.171054)ns
Log likelihood	-74.43862	-31.55752	-28.43362	-
S.E	0.419183	0.341792	0.342149	0.345076
R^2	0.219021	0.573083	0.591460	0.070998
F statistic	6.310003***	4.966796***	4.384583***	1.719539ns
DW	1.788268	3.178179	3.181193	1.655208
No of Obs	142	142	142	142
Hausman test				
Dependent variable systematic risk	**Chi 2 (6)**		**Prob < Chi 2**	
	9.136501		0.1660	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

According to fisher statistic, the PLS model is accepted statistically at level of significance equal to 5% while R square equals to 21% meaning that the independent variables explain 21% of the dependent variable. The estimation results show that Derivatives effect on systematic risks is not significant. While, the effect of bank size is positive on systematic risks at level of significance equals to 10%. This means that the large banks have more systematic risks than small banks.

For net interest margin effect, it is negative on systematic risks at level of significance equal to 1%, which revealed that the accounting performance of banks presented in the indicator NIM decreases systematic risks of banks in financial markets. However, liquidity affects positively systematic risks at level of significance equals to 1%, indicating that banks' level of liquidity increases liquidity risk of the banks. Additionally, credit risk affects positively systematic risks of banks at level of significance equals to 5%. This result shows that the increase in credit risk of banks will increase systematic risk of banks. **(See appendix 57)**

The fixed model is accepted at level of significance equals to 5% according to fisher statistic, and R square has improved comparing to the PLS model to 57%. The coefficients signs show that the effect of the variable NIM remains the same comparing to the previous model at 10% level of significance. For the other variables, the effect of derivatives, bank size, liquidity, loan and credit risk on total risk is not significant. **(See appendix 58)**

Although the improvement in R square of the DFE model to 59%, all variables coefficients are not significant. **(See appendix 59)**

Comparing the previous model, all variables are insignificant except for the variables net interest margin and liquidity in the random effect model. The effect of NIM on systematic risk is significantly negative at 5%. This finding means that the increase in the accounting performance of banks reduces systematic risk. For the variable liquidity, it affects positively systematic risks at level of significance equals to 10%. Moreover, the R square decreases to 7 % in the random effect model which is rejected at level of significance equal to 5% according to fisher statistic. **(See appendix 60)**

From Hausman test, Chi square equals to 9.13 for the dependent variable systematic risks and as the probability is higher than 5% we accept the null hypothesis implying that the random effects models are the appropriate models and reject the alternative hypothesis. Hence, this result indicates that the studied variables have a random effect. **(See appendix 61)**

II.1.5.2. Specification tests results

II.1.5.2.A. Matrix of correlation

The correlations between variables of the model are presented in the following matrix:

Table (3.76): Matrix of correlations (Systematic risk is the dependent variable)

	Derivatives	Size	NIM	Liquidty	Loan	Credit risk	Constant
Derivatives	1.0000						
Size	-0.4251	1.0000					
NIM	0.1542	-0.0335	1.0000				
Liquidity	-0.0972	0.3826	-0.2408	1.0000			
Loan	0.0438	-0.0269	-0.5696	0.3139	1.0000		
Credit risk	-0.0654	0.0117	-0.3195	-0.2408	0.0517	1.0000	
Constant	0.1212	-0.6888	-0.0165	-0.5554	-0.5148	0.0186	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.77): Multicollinearity test results of the third model

Variable	VIF	1/ VIF
NIM	1.85	0.541693
Loan	1.63	0.612477
Liquidity	1.54	0.649774
Size	1.50	0.668749
CreditR	1.31	0.766005
Derivatives	1.29	0.774020
Mean VIF	1.52	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

II.1.5.2.B. Heteroscedasticity test

The following table (3.78) provides the results of heteroscedasticity test using Breusch-Pagan.

Table (3.78): Breusch-Pagan Heteroskedasticity test results

Dependent variable	**Chi 2(1)**	**P -value**
Systematic risk	230.84	0.0000

Source: by the author according to Stata16 results

From the above table, the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 62)**

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.79): White test results for Heteroskedasticity

Dependent variable	**Chi 2(27)**	**P -value**
Systematic risk	41.91	0.0336

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 63)**

II.1.5.2.C. Endogeneity test

Table (3.80): Endogeneity test results (Systematic risk as the dependent variable)

<table>
<tr><th colspan="2">Instruments</th><th>Chi-sq (1)</th><th>P-value</th></tr>
<tr><td>Included</td><td>NIM, liquidity, loan, credit risk.</td><td rowspan="2">1.570</td><td rowspan="2">0.2102</td></tr>
<tr><td>Excluded</td><td>Size</td></tr>
<tr><td>Included</td><td>Size, Liquidity, loan, credit risk.</td><td>3.326</td><td>0.0682</td></tr>
</table>

Excluded	NIM		
Included	Size, NIM, Loan, credit risk	0.039	0.8432
Excluded	Liquidity		
Included	Size, NIM, liquidity, credit risk	0.118	0.7314
Excluded	Loan		
Included	Size, NIM, liquidity, loan	0.127	0.7213
Excluded	Credit risk		

Source: by the author according to Stata 16 results

According to the table' results, the p-value of the majority estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. Hence, we should run a GMM model. **(For more details see appendix 64)**

As a result, because of the existence of both heteroscedasticity and endogeneity problem and as known before our number of banks (groups) is greater than the number of the time period, we can use GMM estimator in order to have best results of our regression.

II.1.5.3. GMM Panel analysis

In the table (3.81), the results of estimation using GMM are presented.

Table (3.81): Estimation outputs using GMM of the third model (Systematic risk as the dependent variable)

Variables	Systematic risk
Systematic risk (-1)	-0.399542 (-33.52403)***
Derivatives	-6.256027 (-1.998938)**
Size	-0.885585 (-2.930452)***
NIM	-0.033368 (-0.558510)^{ns}
Liquidity	0.890832 (1.796723)*
Loan	1.756281 (4.691717)***
Credit risk	-0.026057 (-2.902011)***
Num of Obs	98
Hansen test (J-statistic)	11.72629
P-value of Hansen test	0.229184
Arrellano & Bond test AR (1)	-1.727317
P-value of AR (1)	0.0841
Arrellano & Bond test AR (2)	-1.196989
P-value of AR (2)	0.2313

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 65 and 66)**

Moreover, the significance of the lagged value of the dependent variable approve the validation of GMM model, while the effect of derivative instruments is negative on systematic risk of banks at level of significance equals to 5%. Moreover, the same effect of bank size on systematic risk at 1% level of significance.

As concerning the variables liquidity and loan they affect positively the systematic risk of banks at level of significance equals to 10% and 1% respectively. While, credit risk results show that its effect on systematic risk is negative at 1% level of significance. For the variables net interest margin, it effect on banks systematic risk is not comprehensible due to its insignificance.

II.1.6. Summaries and Discussions

This analysis aims to determine the impact of derivative instruments on systematic risk of banks from GCC countries.

From the static panel, results indicate that the derivatives instruments have no significant effect on banks' systematic risk. This finding cannot corroborate the theory stipulating that using derivatives instruments reduce risk in banks. Additionally, the effect of bank size is also not clear on the systematic risk of banks. This finding cannot corroborate the literature results stipulating that bank size increases systematic risk of banks meaning that larger banks are more risky than small banks

For the variable net interest margin, the association with systematic risk of banks was negative contrary to what it was expected comparing to literature results.

Liquidity affects positively systematic risks. This result indicates that banks' level of liquidity increases liquidity risk of the banks and thereby systematic risks are higher.

Finally, the effect of loan and credit risk on systematic risks of banks cannot be comprehensible because of the insignificance of their coefficient.

Moreover, the results of GMM estimation expose the negative effect of Derivative instruments on total risk of banks, this result is in line with the literature and it can be interpreted that although our sample banks have a small derivatives markets comparing to the developed countries, they manage their use of derivatives instruments in order to hedge their systematic risks.

As concerning the bank size affect negatively banks systematic risks. This result does not support the theory stipulating that the size of banks influences positively banks risks. The theory suggests that large banks are riskier than small banks.

However, the effect of credit risk is negative, which means that the increase in credit risk of banks will decrease their systematic risks. This finding rejects the unpredicted results.

Finally, the effect of liquidity and loan on banks systematic risk is positive. Consequently, it appears that the literature results stipulating the liquidity and loan have a negative effect on bank risks is rejected. For net interest margin effect on systematic risks is not clear.

To summarize, the finding suggests that banks seem to reduce their systematic risks by using derivative instruments. Indeed, deducing results are similar to literature findings and the argument that stipulate that derivatives usage decrease systematic risks of banks. Hence, our hypothesis is accepted.

The table (3.82) summarizes the main regression results of our model.

Table (3.82): Systematic risk Regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	NS	NS	NS	NS	-
Size	+	NS	NS	NS	NS	-
NIM	-	-	NS	-	-	NS
Liquidity	+	NS	NS	+	+	+
Loan	NS	NS	NS	NS	NS	+
credit risk	+	NS	NS	NS	NS	-

Source: by the author depending on Eviews 9 results

II.1.7. Regression analysis

II.1.7.1. Static Panel analysis

The results of the third model estimation where the dependent variable is specific risk as a measure for capital market risk are provided in the table (3.83).

Table (3.83): Estimation outputs of the third model (Specific risk as the dependent variable)

Independent Variable	Method of estimation			
	PLS	FEM	DFE	REM
C	0.313651 (0.391136)ns	16.59354 (4.545565)***	6.864658 (1.256357)ns	2.878592 (2.251315)**
Derivatives	4.375031 (0.455914)ns	-22.20591 (-1.717168)*	-28.50589 (-2.140987)**	-6.631744 (-0.612636)ns
Size	0.165365 (1.446879)ns	-2.487424 (-3.536162)***	-0.420934 (-0.378211)ns	-0.073162 (-0.392392)ns
NIM	-0.502267 (-3.055374)***	-0.895221 (-4.576512)***	-0.786096 (-3.989931)***	-0.500133 (-3.293692)***
Liquidity	6.163225 (4.771680)***	-2.513084 (-1.459165)ns	-3.999995 (-2.224886)**	1.381166 (0.976727)ns
Loan	-0.879363 (-0.899391)ns	-2.827752 (-1.662085)*	-2.674570 (-1.589023)ns	-1.823456 (-1.574420)ns
Credit risk	0.119112 (2.788990)***	0.095104 (1.785659)*	0.097628 (1.851229)*	0.102420 (2.203814)**
Log likelihood	-162.5227	-86.45459	-80.90954	-
S.E	0.779474	0.503106	0.495118	0.536284
R^2	0.305155	0.761992	0.779873	0.130912
F statistic	9.881335***	11.84567***	10.72969***	3.389204***
DW	0.996328	2.285382	2.348375	1.774827
No of Obs	142	142	142	142

Hausman test		
Dependent variable specific risk	Chi 2 (6)	Prob < Chi 2
	25.066923	0.0003

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

In the PLS model the independent variables explain 30% of the dependent variable according to R square and the model is statically accepted at level of significance equals to 5% according to fisher statistic. The estimation results show that Derivatives, size and loan effects on specific risks are not significant. While, the effect of net interest margin is negative on specific risks at level of significance equals to 1%. This revealed that the performance of banks decreases specific risks of banks in financial markets. However, liquidity affects positively specific risks at level of significance equals to 1%. This result indicates that banks' level of liquidity increases liquidity risk of the banks. Finally, credit risk affects positively specific risks of banks at level of significance equals to 1%. This finding shows that the increase in credit risk of banks will increase risk of banks. **(See appendix 67)**

The fixed model is accepted at level of significance equals to 5% according to fisher statistic, and R square has improved to 76%. The results show that the effect of derivatives is negative on specific risk at level of significance equals to 10%, which means that using derivatives instruments in banks will reduce their specific risk. For the bank size impact on specific risk, it is also negative at 1% level of significance. This result means that the larger the banks are the less specific risk they face. Moreover, for the variable net interest margin, it affects negatively the banks specific risk at level of significance equals to 1%, indicating that the performance of bank is negatively correlated to the specific risks of banks. Furthermore, the variable loan is negatively correlated with the specific risk of banks at level of significance equals to 10%. This finding implies that the increase in loan will decrease the specific risk of banks. Lastly, credit risk affects positively the specific risk of banks at 10% level of significance, which means that the rise in the credit risk will automatically increase the level of specific risk of banks. For the variable liquidity, its effect is not clear due to its insignificance. **(See appendix 68)**

R square has improved in the DFE model to 77% and the model is statically accepted according to fisher statistic. Comparing to the previous model, the effect of derivatives net interest margin and credit risk remains the same at level of significance equals to 5%, 1% and 10% respectively, while the effect of the bank size and loan become insignificant. As concerning the variable liquidity, its effects become negative and significant at 5% level of significance. This result reveals that the increase in levels of liquidity will decrease the specific risk of banks. **(See appendix 69)**

Comparing the previous model, all variables are insignificant except for the variables net interest margin and credit risk in the random effect model. The effect of NIM on specific risk is significantly negative at 5%. This means that the increase in the performance of banks reduces specific risks. For the variable credit risk, it affects positively specific risks at level of significance equals to 10%. Moreover, the R square decreases to 13 % in the random effect model which is accepted at level of significance equal to 5% according to fisher statistic. **(See appendix 70)**

From Hausman test, Chi square equals to 25.06 for the dependent variable specific risks and as the probability is less than 5% we reject the null hypothesis thereby we accept the alternative hypothesis implying that the fixed effects models are the appropriate models. **(See appendix 71)**

II.1.7.2. Specification test results

II.1.7.2.A. Matrix of correlation

In the following matrix, the correlations between variables of the third model are presented.

Table (3.84): Matrix of correlations (Specific risk is the dependent variable)

	Derivatives	Size	NIM	Liquidty	Loan	Credit risk	Constant
Derivatives	1.0000						
Size	-0.4251	1.0000					
NIM	0.1542	-0.0335	1.0000				

Liquidity	-0.0972	0.3826	-0.2408	1.0000			
Loan	0.0438	-0.0269	-0.5696	0.3139	1.0000		
Credit risk	-0.0654	0.0117	-0.3195	-0.2408	0.0517	1.0000	
Constant	0.1212	-0.6888	-0.0165	-0.5554	-0.5148	0.0186	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.85): Multicollinearity test results of the third model

	VIF	1/VIF
NIM	1.85	0.541693
Loan	1.63	0.612477
Liquidity	1.54	0.649774
Size	1.50	0.668749
CreditR	1.31	0.766005
Derivatives	1.29	0.774020
Mean VIF	1.52	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

II.1.7.2.B. Heteroscedasticity test

The following table represents the results of heteroscedasticity test of our third model where specific risk is the dependent variable.

Table (3.86): Breusch-Pagan Heteroskedasticity test results

Dependent variable	**Chi 2(1)**	**P –value**
Specific risk	189.81	0.0000

Source: by the author according to Stata16 results

From the table (3.86), the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 72)**

Moreover, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.87): White test results for Heteroskedasticity

Dependent variable	**Chi 2(27)**	**P –value**
Specific risk	78.99	0.0000

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 73)**

II.1.7.2.C. Endogeneity test

The next table provides the results of endogeneity test of our third model.

Table (3.88): Endogeneity test results (Specific risk as the dependent variable)

Instruments		Chi-sq (1)	P-value
Included	NIM, liquidity, loan, credit risk.	11.846	0.0006
Excluded	Size		
Included	Size, Liquidity, loan, credit risk.	18.572	0.0000
Excluded	NIM		
Included	Size, NIM, Loan, credit risk	2.202	0.1378
Excluded	Liquidity		
Included	Size, NIM, liquidity, credit risk	2.841	0.0919
Excluded	Loan		
Included	Size, NIM, liquidity, loan	3.267	0.0707
Excluded	Credit risk		

Source: by the author according to Stata 16 results

According to the results of table (3.88), the p-value of the majority estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. Hence, we should run a GMM model. **(For more details see appendix 74)**

Due to the confirmation of the existence of heteroskedasticity and endogeneity problem and the fact that the number of banks (groups) is greater than the number of the time period, the use of GMM estimator is appropriate for our model.

II.1.7.3. GMM Panel analysis

The results of GMM estimation are presented in the next table.

Table (3.89): Estimation outputs using GMM of the third model (Specific risk as the dependent variable)

Variables	Specific risk
Specific risk (-1)	-0.118995 (-11.03646)***
Derivatives	-24.21771 (-3.970480)***
Size	-4.150148 (-8.780329)***
NIM	-1.143527 (-12.57543)***
Liquidity	-1.709826 (-2.529480)**

Loan	-1.376463 (-1.938117)*
Credit risk	0.096265 (2.531653)**
Num of Obs	98
Hansen test (J-statistic)	18.94256
P-value of Hansen test	0.256861
Arrellano & Bond test AR (1)	-1.271366
P-value of AR (1)	0.2036
Arrellano & Bond test AR (2)	0.832375
P-value of AR (2)	0.4052

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 75 and 76)**

Moreover, the lagged value of the dependent variable is significant which improve the choice of GMM model. The effect of derivative instruments is negative on specific risk of banks at level of significance equals to 1%. Moreover, the same effect of bank size on specific risk at 1% level of significance.

As concerning the variable net interest margin, liquidity and loan they affect negatively the specific risk of banks at level of significance equals to 1%, 5% and 10% respectively, while credit risk effect is positive on specific risk at 5% level of significance.

II.1.8. Summaries and Discussions

This analysis aims to determine the impact of derivative instruments on specific risk of banks from GCC countries.

From the static panel, estimation results indicate that the derivatives instruments effect on banks' specific risk is negative. This finding corroborates the theory stipulating that using derivatives instruments reduce risk in banks, which is in line with theory and literature results and support the expectations that stipulate that the derivatives instruments are hedging tools which are useful to reduce risks of banks.

Additionally, the effect of bank size, liquidity and loan is also not clear on the specific risk of banks. These findings cannot corroborate the literature results stipulating that bank size increases risk of banks meaning that larger banks are more risky than small banks in addition to the theory stipulating that liquidity and loan have a negative effect on banks specific risk. For the variable net interest margin, the association with specific risk of banks was negative contrary to what it was expected comparing to literature results.

Moreover, the effect of credit risk on specific risks of banks is positive. This finding is in line with the predicted results and according to the literature results.

The results of GMM estimation show that the use of financial derivatives affects negatively specific risk of banks. This result is in line with the literature and it can be interpreted that although our sample banks have a small derivatives markets comparing to the developed countries, they manage their use of derivatives instruments in order to hedge their specific risks.

As concerning the bank size affect negatively banks specific risks. This result does not corroborate the theory stipulating that the size of banks influences positively banks risks. The theory suggests that large banks are riskier than small banks. For net interest margin effect on specific risks is negative, meaning that the increase in the bank's performance will decrease their specific risk. This finding is in line with the literature results. However, the effect of credit risk is positive, which means that the increase in credit risk of banks will increase their specific risks. This finding supports the predicted results. Finally, the effect of liquidity and loan on banks specific risk is negative. Consequently, it appears that the literature results stipulating the liquidity and loan have a negative effect on bank risks is accepted.

To summarize, the finding suggests that banks seem to reduce their specific risks by using derivative instruments. Indeed, deducing results are similar to literature findings and the argument that stipulate that derivatives usage decrease systematic risks of banks. Hence, our hypothesis is accepted.

The following table summarizes the main regression results of our model.

Table (3.90): Specific risk Regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	-	-	NS	-	-
Size	NS	-	NS	NS	NS	-
NIM	-	-	-	-	-	-
Liquidity	+	NS	-	NS	NS	-
Loan	NS	-	NS	NS	NS	-
Credit risk	+	+	+	+	+	+

Source: by the author depending on Eviews 9 results

II.2. The effect of financial derivatives on banks' accounting risk

The aim of this analysis is to examine the effect of derivative instruments on banks' accounting risks starting with leverage risk, then liquidity risk and lastly credit risk. Therefore this part is organized as follow: Data and sample are described, as well as the methodology in first place then estimation results and analysis and lastly summaries and discussions are provided.

II.2.1. Data, sample and methodology

II.2.1.1. Data

In order to achieve the aim of this analysis, an annual accounting data of each bank were used in our model as dependent and independent variables obtained from Bank Focus data base during the period 2006-2018.

II.2.1.2. Sample

Our sample is composed of 25 banks from GCC countries as described in the first part. **(For more details see table (3.1))**

II.2.1.3. Methodology

Firstly, we begin with the definition of the used variables in our fourth model depending on literature. Then, our study hypothesis is set according to the expected results.

II.2.1.3.A. Variables description

The table represents (3.91) both dependent and independent variables used in this analysis.

Table (3.91): Variables definition

Variables	Proxy	Definition	References
Dependent variable			
Leverage risk	Accounting risk	The ratio of the total equity divided on total asset	Keffala (2012)
Liquidity risk		The ratio of liquid assets to total assets	Keffala (2012); (S. Li & Marinč, 2014a); (Kornel, 2014).
Credit risk		The ratio of loan loss-reserves to gross loans.	Keffala (2012); (S. Li & Marinč, 2014a); (Kornel, 2014).
Independent variables			
Derivatives	Derivatives	The notional value of derivatives divided by total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
Size	Bank size	Natural log of total assets.	Chaudhry et al (2000); Reichert and Shyu (2003).
NIM	Net interest	The difference between total	Chaudhry et al (2000);

	margin	interest income and total interest expense expressed as a percentage of total assets.	Reichert and Shyu (2003).

Source: by the author depending on literature review

From the above table, the dependent variable is divided to three measures as proxies for accounting risks of banks. Represented in leverage risk, liquidity risk and credit risk as described earlier. For the independent variables, we have derivative instruments, bank size, net interest margin. The choice of these variables is according to previous studies and literature as described in the previous table.

II.2.1.3.B. Testing hypotheses and expected results

Previous studies such as (Chaudhry et al 2000, Reicchert and Shyu 2003; Keffala 2012) found that overall derivative instruments affect negatively bank risk. Hence, our second hypothesis stipulates that the effect of derivative instruments is negative on banks' risks.

For variables bank size and net interest margin according to literature and the theory, they have a positive effect on bank accounting risks (Chaudhry et al 2000, Reichert and Shyu 2003; Keffala 2012).

The following table provides the predicted effect of the independent variables and their references.

Table (3.92): The predicted relationship between dependent variable and independent variables

Variables	**Expected sign**	**References**
Derivatives	-	(Chaudhry et al 2000, Reichert and Shyu 2003, Keffala 2012)
Size	+	(Chaudhry et al 2000, Reichert and Shyu 2003, Keffala 2012)
NIM	+	(Chaudhry et al 2000, Reichert and Shyu 2003, Keffala 2012)

Source: by the author depending on literature review results

II.2.2. Empirical analysis

II.2.2.1. Empirical model

The equation below represents the conceptual model of the second part of this section which describes the effect of derivatives on accounting risk of banks.

Fourth model

$$Accounting\ risk_{i,t} = \alpha_0 + \alpha_1 Derivatives_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 NIM_{i,t} + \varepsilon_{it}$$

Where:

Accounting risk measures are leverage risk, liquidity risk and credit risk in each regression.

ε_{it}: is the random error.
The other variables are defined previously.

II.2.2.2. Unit root test

As seen below, the stationarity of the variables is checked using several tests. Trying with individual intercept, then individual intercept and trend and finally without individual intercept and trend. The results are as follow:

Table (3.93): Stationarity test results

Variables	LLC	IPS	ADF	PP	Decision
Leverage risk	-21.2359 (0.0000)	-12.2931 (0.0000)	154.671 (0.0000)	228.136 (0.0000)	Stationary at level
Liquidity risk	-3.03821 (0.0012)	-3.33152 (0.0004)	89.4603 (0.003)	109.291 (0.0000)	Stationary at level
Credit risk	-8.49817 (0.0000)	-3.90960 (0.0000)	94.4634 (0.0001)	71.5909 (0.0242)	Stationary at level
Derivatives	-63.0980 (0.0000)	-12.1034 (0.0000)	82.7248 (0.0025)	78.7588 (0.0058)	Stationary at level
Size	-37.6437 (0.0000)	-15.4769 (0.0000)	99.9018 (0.0000)	115.241 (0.0000)	Stationary at level
NIM	-11.5902 (0.0000)	-6.03045 (0.0000)	133.797 (0.0000)	156.317 (0.0000)	Stationary at level

Source: by the author depending on Eviews 9 results

According to the results of table (3.93), the stationarity of all variables is checked since the P value of the majority of tests is closed to 0, which means we reject the null hypothesis of Unit Root at 5 % significance level.

II.2.2.3. Descriptive statistics

The tables below describe the statistical variables used in the model divided according to our sample countries.

Table (3.94): Panel A. descriptive statistics of variables from UAE

UAE

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0085	0,0069	0,0276	0,0001	0,0085	0,7768	2,3887	3,4843
SIZE	5,0697	4,9894	5,6091	4,5825	0,3123	0,1107	1,9212	1,5160
NIM	3,3457	3,1800	4,4400	2,4000	0,5527	0,6431	2,3553	2,5876
LIQUIDITY_RISK	0,1651	0,1435	0,3268	0,0805	0,0654	1,1621	3,3801	6,9333
CREDIT_RISK	5,5157	5,0950	8,7100	2,0500	1,7830	0,1954	2,0894	1,2275
LEVERAGE_RISK	0,9998	0,9998	1,0000	0,9996	0,0001	-0,8039	2,6723	3,3657

Source: by the author depending on Eviews 9 results

According to Jarque-Bera, all variables are normally distributed in UAE except for liquidity risk, while Skewness is ranging from -0.80 to 1.16 and Kurtosis is also ranging from 1.92 to 3.38. For the variable derivatives 'average is 0.0085 with a maximum of 0.02 and standard deviation of 0.0085. In addition, the variable size has a maximum of 5.60 and standard deviation of 0.31 with an average of 5.06; while net interest margin has a maximum of 4.44 and a standard deviation of 0.55. Moreover, the variable liquidity risk has an average of 0.16 and maximum value of 0.32 with a standard deviation of 0.06. Furthermore, the variable credit risk has a standard deviation of 1.78 and maximum value of 8.71, while the variable leverage has an average of 0.99 and standard deviation of 0.0001.

Table (3.95): Panel B. descriptive statistics of variables from Bahrain

Bahrain

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0046	0,0034	0,0211	0,0002	0,0046	1,7711	6,5997	32,9433
SIZE	4,2495	4,3939	6,5755	3,2289	0,7736	1,3594	5,9007	21,0746
NIM	2,2597	2,3450	3,1300	1,1300	0,5148	-0,3775	2,4019	1,2371
LIQUIDITY_RISK	0,1898	0,1928	0,3454	0,0000	0,0742	-0,6783	3,8828	3,4932
CREDIT_RISK	3,9457	3,9050	6,9000	1,3900	1,2763	0,2143	3,3176	0,3557
LEVERAGE_RISK	0,9984	0,9995	0,9998	0,9934	0,0018	-1,1991	3,1734	7,2263

Source: by the author depending on Eviews 9 results

In Bahrain, the results show that all variables are normally distributed according to Jarque-Bera probability while Skewness ranges from –1.19 to 1.77 and Kurtosis also ranges from 2.40 to 6.59. Derivatives in Bahrain have an average of 0.0046 with a maximum value of 0.0211 and a standard deviation of 0.0046. For the variable size it has an average of 4.24 and standard deviation of 0.77 while maximum value is equal to 6.57. In addition, net interest margin has a maximum of 4.44 with standard deviation of 8.89. Moreover, the maximum value of liquidity risk is equal to 0.18 while its standard deviation is 0.07. However, the variable credit risk has a maximum value of 6.90 and a standard deviation of 1.27. Lastly, the variable leverage risk has a standard deviation of 0.0018 with an average of 0.99.

Table (3.96): Panel C. descriptive statistics of variables from Kuwait

Kuwait

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0003	0,0002	0,0008	0,0000	0,0003	0,2922	1,3065	1,4711
SIZE	3,8373	3,5915	4,3729	3,3899	0,4194	0,1863	1,1817	1,5790
NIM	3,1109	3,1000	3,5300	2,8400	0,2508	0,6229	2,0062	1,1641
LIQUIDITY_RISK	0,2390	0,2410	0,3338	0,1555	0,0541	0,0385	2,1335	0,3468
CREDIT_RISK	3,9200	3,9100	4,3500	3,3000	0,3740	-0,3476	1,7586	0,9278
LEVERAGE_RISK	0,9977	0,9976	0,9994	0,9956	0,0015	-0,2102	1,4551	1,1748

Source: by the author depending on Eviews 9 results

In Kuwait all variables are normally distributed according to Jarque-Bera results and Skewness ranges from -0.34 to 0.62 while Kurtosis ranges from 1.18 to 2.13. The average of derivatives is 0.003 with a maximum of 0.008 and standard deviation of 0.003. For the variable size the maximum value is 4.37 while the standard deviation is equal to 0.41 with an average of 3.83. In addition, net interest margin has a maximum value of 3.53 and a standard deviation of 0.25. For liquidity risk, its average is 0.23 and standard deviation of 0.05.

Moreover, credit risk has a maximum of 4.35 with a standard deviation of 0.37. The average of leverage risk is 0.99 and its standard deviation is 0.0015.

Table (3.97): Panel D. descriptive statistics of variables from Qatar

Qatar

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0017	0,0006	0,0098	0,0000	0,0022	2,0455	7,1962	41,5007
SIZE	4,8713	4,7960	5,7313	4,2534	0,4335	0,5973	2,4120	2,1420
NIM	2,8366	2,9200	3,8000	1,7000	0,5386	-0,7449	2,9181	2,6901
LIQUIDITY_RISK	0,1360	0,1374	0,2668	0,0559	0,0498	0,6349	3,3913	2,1330
CREDIT_RISK	2,1110	2,0100	3,6400	0,6600	0,8383	0,1711	2,0279	1,2834
LEVERAGE_RISK	0,9997	0,9998	1,0000	0,9992	0,0002	-0,8932	2,8858	3,8720

Source: by the author depending on Eviews 9 results

According to The results, Jarque-Bera indicates that all variables are normally distributed except for derivatives in Qatar. As for Skewness it is ranging from -0.89 to 2.04 and Kurtosis is also ranging from 2.02 to 7.19. Concerning the variable derivatives in Qatar it has an average of 0.0017 with a maximum of 0.0098 and a standard deviation of 0.0022; while the variable size standard deviation is equal to 0.43 with a maximum of 5.7 and an average of 4.87. Moreover, net interest margin, it has a standard deviation equals to 0.53 and a maximum of 3.80. Furthermore, liquidity risk maximum value is equal to 0.26 and a standard deviation of 0.04 while average is equal to 0.13; credit risk has a maximum of 3.64 and a standard deviation of 0.83. The average value of leverage risk is 0.99 with a standard deviation of 0.0002.

Table (3.98): Panel E. descriptive statistics of variables from Saudi Arabia

Saudi Arabia

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0113	0,0118	0,0345	0,0009	0,0097	0,7439	2,6133	3,5443
SIZE	5,1664	5,2311	5,3715	4,7117	0,1732	-1,3287	4,0145	12,1370
NIM	2,5967	2,5950	3,0500	1,9300	0,2522	-0,6369	3,5405	2,8720
LIQUIDITY_RISK	0,1123	0,1002	0,2200	0,0587	0,0361	0,8010	3,3623	4,0464
CREDIT_RISK	2,4769	2,1100	7,6500	1,3000	1,3073	2,3649	9,0555	88,5601
LEVERAGE_RISK	0,9999	0,9999	0,9999	0,9997	0,0001	-2,5434	8,4121	82,7500

Source: by the author depending on Eviews 9 results

For Saudi Arabia results the variables are normally distributed according to Jarque-Bera except for size, credit risk and leverage risk. Skewness ranges from -2.54 to 2.36 while Kurtosis ranges also from 2.61 to 9.05. The average of derivatives in Saudi Arabia banks is equal to 0.0113 with a maximum of 0.0345 and a standard deviation of 0.0097; for size the average is 5.16 with a standard deviation of 0.17 and a maximum of 5.37. Moreover, net interest margin is 3.05 with a standard deviation of 0.25; while liquidity risk standard deviation is 0.03 and maximum of 0.22 with an average of 0.11. Moreover, credit risk maximum value is 7.65 with a standard deviation of 1.30. For leverage risk average, it is equal to 0.99 while its standard deviation is equal to 0.0001.

Table (3.99): Panel F. descriptive statistics of variables from Oman

Oman

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0020	0,0017	0,0067	0,0000	0,0019	0,8872	3,0068	2,4927
SIZE	3,5084	3,4045	4,0985	2,9868	0,3199	0,4095	2,0376	1,2643
NIM	3,1374	3,2100	3,9100	2,3500	0,4676	-0,0981	1,9581	0,8898
LIQUIDITY_RISK	0,1828	0,1708	0,2754	0,1262	0,0431	0,5930	2,3237	1,4757
CREDIT_RISK	3,4642	3,4200	4,7400	2,2800	0,6486	0,3406	2,3589	0,6928
LEVERAGE_RISK	0,9950	0,9952	0,9991	0,9879	0,0031	-0,6383	2,8048	1,3204

Source: by the author depending on Eviews 9 results

Oman results indicate that all variables were normally distributed according to Jarque-Bera and Skewness ranges from –0.63 to 0.88 while Kurtosis ranges from 1.95 to 3.00.

For the variable derivatives maximum value is 0.0067 with an average of 0.0020 and a standard deviation of 0.0019. Concerning the variable size' average is 3.50 with a maximum of 4.09 and a standard deviation of 0.31. Additionally, net interest margin maximum values are 85.02 and 3.91 respectively. For liquidity risk the average is equal to 0.18 with a standard deviation of 0.04 and a maximum value of 0.27. In addition, credit risk maximum value is 4.74 with a standard deviation of 0.64. The average of loan is 0.67, while leverage risk has a standard deviation of 0.0031 with an average of 0.9950.

As a conclusion, UAE banks are the most users of derivative instruments in GCC countries with a standard deviation of 0.0085. Moreover, the Saudi Arabian banks are the larger banks while the smallest banks are Kuwait banks. As for net interest margin the highest scores are in UAE banks followed by Oman, Qatar, Kuwait, Bahrain and lastly Saudi Arabia where the standard deviation in UAE is the highest with a score of 0.5527 and the lowest standard deviation is in Kuwait, the high liquidity levels is in Kuwait banks followed by Oman, Bahrain, UAE, Qatar and lastly Saudi Arabia, for the standard deviation which is a measure of risk the highest level is in Bahrain and the lowest in Saudi Arabia. In addition, UAE banks have the highest level of credit risk followed by Saudi Arabia, Bahrain, Oman, Kuwait and lastly Qatar, while the standard deviation high level is in UAE and the lowest is in Kuwait. Finally, the highest level of leverage risk is in UAE banks followed by Saudi Arabia, Qatar, Bahrain, Kuwait and lastly Oman, while the standard deviation of this risk was lower in both Saudi Arabia and UAE banks and higher in Oman banks

II.2.3. Regression analysis

II.2.3.1. Static Panel analysis

In the next table, the estimation results of the fourth model are summarized starting with leverage risk as the dependent variable.

Table (3.100): Estimation outputs of the fourth model (Leverage risk as the dependent variable)

Independent Variable	Method of estimation			
	PLS	**FEM**	**DFE**	**REM**
C	0.987288 (1288.394)***	0.983798 (388.6391)***	0.982305 (186.9347)***	0.985236 (739.0580)ns
Derivatives	-0.014669 (-1.404730)ns	0.000591 (0.048850)ns	-0.002945 (-0.228794)ns	-0.004005 (-0.361128)ns
Size	0.002671 (19.25963)***	0.003337 (6.552923)***	0.003644 (3.301401)ns	0.003044 (11.68669)***
NIM	-0.000227 (-1.610569)ns	-0.000118 (-0.733492)ns	-8.32E-05 (-0.488258)ns	-0.000166 (-1.126316)ns
Log likelihood	1148.450	1242.814	1244.169	-
S.E	0.001289	0.000889	0.000905	0.000896
R^2	0.659040	0.855974	0.857746	0.400224
F statistic	138.5239***	42.04271***	30.48330***	47.82244***
DW	0.184572	0.417219	0.439551	0.369320
No of Obs	219	219	219	219
Hausman test				
Dependent variable leverage risk	**Chi 2 (3)**		**Prob < Chi 2**	
	1.090688		0.7793	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

In the PLS model, R square equals 65% which means that the independent variables explain 65% of the dependent variable and the model is statically accepted at level of significance equals to 5% according to fisher statistic. The results show that Derivatives and net interest margin effect on leverage risk is not significant. While, the bank size is positive on leverage risk at level of significance equals to 1%. This revealed that any grow in bank size increases their leverage risk. **(See appendix 77)**

The fixed model is accepted at level of significance equals to 5% according to fisher statistic, and R square has improved to 85%. The results remain the same comparing to the previous model, with the insignificance of both derivatives instruments and net interest margin. Hence, their effect on leverage risk is not clear. For the variable bank size, its positive effect remains the same at level of significance equals to 1%. **(See appendix 78)**

Although R square in the DFE model is 85% and the model is statically accepted according to fisher statistic, the effect of all variables on leverage risk is not comprehensible and cannot be interpreted due to the insignificance of their coefficients. **(See appendix 79)**

The random effect model is statically significant according to fisher statistic and R square decreases to 40%. The effect of bank size on leverage risk is significantly positive at 1%. This means that large banks have higher leverage risk their small bank. For the variables derivatives and net interest margin, their effect on leverage risk in not significant. **(See appendix 80)**

From Hausman test, Chi square equals to 1.09 for the dependent variable leverage risk and as the probability is higher than 5% we reject the alternative hypothesis and accept the null hypothesis implying that the random effects models are the appropriate models. **(See appendix 81)**

II.2.3.2. Specification tests results

II.2.3.2.A. Matrix of correlation

The correlations between variables of the model are resented in the following matrix:

Table (3.101): Matrix of correlations (Leverage risk is the dependent variable)

	Derivatives	Size	NIM	Constant
Derivatives	1.0000			
Size	-0.3510	1.0000		
NIM	0.1172	0.0509	1.0000	
Constant	0.1370	-0.8293	-0.5816	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.102): Multicollinearity test results of the fourth model

	VIF	1/VIF
Derivatives	1.16	0.858547
Size	1.15	0.868249
NIM	1.02	0.976621
Mean VIF	1.11	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

II.2.3.2.B. Heteroscedasticity test

The table (3.103) provides the results of heteroskedasticity test using Breusch-Pagan.

Table (3.103): Breusch-Pagan Heteroskedasticity test results

Dependent variable	**Chi 2(1)**	**P –value**
Leverage risk	224.97	0.0000

Source: by the author according to Stata16 results

From the above table, the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 82)**

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.104): White test results for Heteroskedasticity

Dependent variable	Chi 2(9)	P –value
Leverage risk	63.03	0.0000

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 83)**

II.2.3.2.C. Endogeneity test

The next table represents the results of endogeneity of the fourth model.

Table (3.105): Endogeneity test results (Leverage risk as the dependent variable)

Instruments		Chi-sq (1)	P-value
Included	NIM	35.610	0.0000
Excluded	Size		
Included	Size	0.545	0.4604
Excluded	NIM		

Source: by the author according to Stata 16 results

According to the results of table (3.105), the p-value of the estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. Thus, we should run a GMM model. **(For more details see appendix 84)**

According to the results of both heteroskedasticity and endogeneity additionally to the fact that our number of banks sample (groups) is greater than the number of the time period, we can use GMM estimator in order to have better results of our regression.

II.2.3.3. GMM Panel analysis

The table (3.106) represents the results of our fourth model estimation where leverage risk is used as a measure for accounting risk of banks.

Table (3.106): Estimation outputs using GMM of the fourth model (Leverage risk as the dependent variable)

Variables	Leverage risk
leverage risk (-1)	0.119553 (22.72217)***
Derivatives	6.11E-06 (0.033230)^{ns}
Size	0.001594 (314.3676)***

NIM	-5.32E-05 (-181.7653)***
Num of Obs	168
Hansen test (J-statistic)	24.23545
P-value of Hansen test	0.281791
Arrellano & Bond test AR (1)	0.228854
P-value of AR (1)	0.8190
Arrellano & Bond test AR (2)	0.747577
P-value of AR (2)	0.4547

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 85 and 86)**

The significance of the dependent variable lagged value validates the application of the GMM model. Moreover the effect of derivative instruments is not significant on leverage risk of banks. Moreover, the effect of bank size on leverage risk is positive and significant at 1% level of significance.

As concerning the variable net interest margin, it affects negatively the leverage risk of banks at level of significance equals to 1%.

II.2.4. Summaries and Discussions

This estimation aims to determine the impact of derivative instruments on leverage risk of banks from GCC countries.

From the results of the static panel estimation, the derivatives instruments effect on banks 'leverage risk is not significant. This finding cannot corroborate the theory stipulating that using derivatives instruments reduce risk in banks and it cannot support the expectations that stipulate that the derivatives instruments are hedging tools which are useful to reduce risks of banks.

Additionally, the effect of bank size on the leverage risk of banks is significantly positive. This finding supports the literature results stipulating that big banks are more risky than small banks size.

For the variable net interest margin, it affects negatively the leverage risk of banks contrary to the theory and what it was expected comparing to literature results.

Moreover, for the effect of derivative instruments on leverage risk of banks in GMM estimation, it is not significant. Consequently, it appears that the theory stipulating that derivatives instruments are hedging tools and useful to reduce risks in banks is rejected.

Concerning the bank size effect on banks leverage risks, it is positive. This result corroborates the theory stipulating that the size of banks influences positively banks risks. The theory suggests that large banks are riskier than small banks. Moreover, net interest margin affects negatively leverage risks, meaning that the increase in the bank's performance will decrease their leverage risk. This finding is not in line with the literature results.

Concluding results suggest that the effect of derivatives instruments on leverage risk in banks is not comprehensible. Hence, the finding cannot support the argument stipulates that derivatives usage decrease risks of banks. Hence, our hypothesis is rejected.

The following table summarizes the main regression results of our model.

Table (3.107): Leverage risk Regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	NS	NS	NS	NS	NS
Size	+	+	NS	+	+	+
NIM	NS	NS	NS	NS	NS	-

Source: by the author depending on Eviews 9 results

II.2.5. Regression analysis

II.2.5.1. Static Panel analysis

The estimation results of the fourth model are presented in table (3.108) with liquidity risk as the dependent variable.

Table (3.108): Estimation outputs of the fourth model (Liquidity risk as the dependent variable)

Independent Variable	Method of estimation			
	PLS	**FEM**	**DFE**	**REM**
C	0.428735 (16.48263)***	0.487913 (16.87488)***	0.455204 (4.716743)***	0.466097 (16.52545)***
Derivatives	0.916211 (2.024169)**	0.340839 (0.593312)ns	-0.233217 (-0.424368)ns	0.572770 (1.084497)ns
Size	-0.051753 (-14.94018)***	-0.058245 (-17.10588)***	-0.049426 (-2.912744)***	-0.056438 (-17.32624)***
NIM	-0.009499 (-1.572179)ns	-0.017673 (-2.74921)***	-0.020062 (-2.813215)***	-0.015100 (-2.476560)***
Log likelihood	338.5302	427.6662	458.4212	-
S.E	0.060581	0.044260	0.040135	0.044374
R^2	0.482924	0.751719	0.807242	0.559059
F statistic	74.40468***	24.10942***	21.79836***	101.0076***
DW	0.658847	1.351258	1.465662	1.214242
No of Obs	243	243	243	243
Hausman test				
Dependent variable liquidity risk	**Chi 2 (3)**		**Prob < Chi 2**	
	3.552895		0.3140	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

R square in the PLS model is equal to 48% which means that the independent variables explain 48% of the dependent variable and the model is statically accepted at level of significance equals to 5% according to fisher statistic. The results show that Derivatives have a positive effect on liquidity risk at level of significance equals to 5%. This means that the use of derivatives instruments in banks tends to increase their liquidity risks. While, bank size affect negatively the liquidity risk at 1% level of significance, which reveals that larger banks have less liquidity risk comparing to smaller banks. For net interest margin, its effect on liquidity risk is not significant. **(See appendix 87)**

The fixed model is accepted at level of significance equals to 5% according to fisher statistic, and R square has improved to 75%. The effect of derivatives on liquidity risk becomes not significant. Hence, their effect on liquidity risks is not clear. While the effect of banks size remains the same comparing to the previous model. In addition, net interest margin affects negatively liquidity risk in banks at level of significance equals to 1%. This result means that the increase in banks performance will decrease their risks. **(See appendix 88)**

R square in the DFE model is 80% and the model is statically accepted according to fisher statistic. The effect of all variables on liquidity risk is the same comparing to the fixed effect model. With the insignificance of derivatives instruments and the negative effect of both bank size and net interest margin on liquidity risk. **(See appendix 89)**

The random effect model is statically significant according to fisher statistic and R square decreases to 55%. The effect of bank size on liquidity risk is significantly negative at 1%. This means that large banks have lower liquidity risk than small bank. The same negative effect of net interest margin on liquidity risk at level of significance equals to 1%. For the derivatives instruments, their effect on liquidity risk is not significant. **(See appendix 90)**

From Hausman test, Chi square equals to 3.55 for the dependent variable liquidity risk and as the probability is higher than 5% we reject the alternative hypothesis and accept the null hypothesis implying that the random effects models are the appropriate models. **(See appendix 91)**

II.2.5.2. Specification tests results

II.2.5.2.A. Matrix of correlation

The following matrix provides the correlations between variables.

Table (3.109): Matrix of correlations (Liquidity risk is the dependent variable)

	Derivatives	Size	NIM	Constant
Derivatives	1.0000			
Size	-0.1318	1.0000		
NIM	0.1121	0.1086	1.0000	
Constant	-0.1039	-0.7120	-0.7500	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.110): Multicollinearity test results of the fourth model

	VIF	1/VIF
Derivatives	1.03	0.966478
Size	1.03	0.967235
NIM	1.03	0.971956
Mean VIF	1.03	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

II.2.5.2.B. Heteroscedasticity test

The table (3.111) provides the results of heteroskedasticity test.

Table (3.111): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P –value

Liquidity risk	13.78	0.0002

Source: by the author according to Stata16 results

From the above table, the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 92)**

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.112): White test results for Heteroskedasticity

Dependent variable	Chi 2(9)	P –value
Liquidity risk	31.18	0.0003

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 93)**

II.2.5.2.C. Endogeneity test

According to the table (3.113) results, the p-value of the estimated regressions is less than 5% which means that there is no endogeneity problem in our model. **(For more details see appendix 94)**

Table (3.113): Endogeneity test results (Liquidity risk as the dependent variable)

Instruments		Chi-sq (1)	P-value
Included	NIM	125.666	0.0000
Excluded	Size		
Included	Size	7.403	0.0065
Excluded	NIM		

Source: by the author according to Stata 16 results

Because of the existence of heteroskedasticity problem and the number of banks (groups) is greater than the number of the time period, we can apply GMM on our fourth model.

II.2.5.3. GMM Panel analysis

The results of GMM estimation on our fourth model are provided by table (3.114).

Table (3.114): Estimation outputs using GMM of the fourth model (Liquidity risk as the dependent variable)

Variables	Liquidity risk
liquidity risk (-1)	0.320813 (8.224498)***
Derivatives	-0.761069 (-3.684927)***
Size	-0.042401

	(-4.050368)***
NIM	-0.035845 (-10.51487)***
Num of Obs	192
Hansen test (J-statistic)	23.87955
P-value of Hansen test	0.298931
Arrellano & Bond test AR (1)	-4.741543
P-value of AR (1)	0.0000
Arrellano & Bond test AR (2)	1.294026
P-value of AR (2)	0.1957

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 95 and 96)**

Moreover, the application of the GMM model is approved because of the significance of the lagged value of the dependent variable. The effect of derivative instruments is negatively significant on liquidity risk of banks at 1% level of significance. This means that using derivatives instruments in banks tends to reduce their liquidity risk. Moreover, the effect of bank size on liquidity risk is negative and significant at 1% level of significance. As concerning the variable net interest margin, it affects negatively the leverage risk of banks at level of significance equals to 1%.

II.2.6. Summaries and Discussions

This estimation aims to determine the impact of derivative instruments on liquidity risk of banks from GCC countries.

From the static panel results, the derivatives instruments effect on banks ‘liquidity risk is not significant. This finding cannot corroborate the theory stipulating that using derivatives instruments reduce risk in banks and it cannot support the expectations that stipulate that the derivatives instruments are hedging tools which are useful to reduce risks of banks.

In addition, the effect of bank size on the liquidity risk of banks is significantly negative. This finding cannot support the literature results stipulating that big banks are more risky than small banks size. For the variable net interest margin, it affects negatively the liquidity risk of banks contrary to the theory and what it was expected comparing to literature results.

Moreover, the GMM estimation results show that the effect of Derivative instruments on liquidity risk of banks is negatively significant which is as expected and in line with literature results. Consequently, it appears that the theory stipulating that derivatives instruments are hedging tools and useful to reduce risks in banks is accepted.

Concerning the bank size effect on banks liquidity risks, it is negative. This result does not corroborate the theory stipulating that the size of banks influences positively banks risks. The theory suggests that large banks are riskier than small banks. Moreover, net interest margin affects negatively leverage risks, meaning that the increase in the bank's performance will decrease their leverage risk. This finding is not in line with the literature results.

Concluding results suggest that the effect of derivatives instruments on liquidity risk in banks is negative. Hence, the finding supports the argument stipulating that derivatives instruments are hedging tools and they decrease risks of banks. Hence, our hypothesis is accepted.

The table (3.115) exposes a summary on the main regression results of our model.

Table (3.115): Liquidity risk Regression coefficient signs summary

Variable	**PLS**	**FEM**	**DFE**	**REM**	**Overall**	**GMM**
Derivatives	+	NS	NS	NS	NS	-
Size	-	-	-	-	-	-
NIM	NS	-	-	-	-	-

Source: by the author depending on Eviews 9 results

II.2.7. Regression analysis

II.2.7.1. Static Panel analysis

The estimation results of the fourth model are presented in table (3.108) where credit risk is used as a measure for accounting risks of banks.

Table (3.116): Estimation outputs of the fourth model (Credit risk as the dependent variable)

Independent Variable	Method of estimation			
	PLS	FEM	DFE	REM
C	4.009923 (4.163620)***	-11.93273 (-3.400941)***	-0.069655 (-0.010344)^{ns}	0.553334 (0.370190)^{ns}
Derivatives	6.571260 (0.500706)^{ns}	-31.34830 (-1.869032)*	-21.44851 (-1.300029)^{ns}	-30.46616 (-2.080993)**
Size	-0.607442 (-3.484482)***	2.566607 (3.636580)***	0.136105 (0.096221)^{ns}	0.036111 (0.125834)^{ns}
NIM	0.670382 (3.790788)***	1.210559 (5.441228)***	0.962938 (-2.813215)***	0.919839 (4.727836)***
Log likelihood	-414.4072	-341.4779	-322.9538	-
S.E	1.620198	1.232111	1.159825	1.282815
R^2	0.121641	0.548737	0.618975	0.113161
F statistic	9.924877***	8.602079***	8.212745***	9.144684***
DW	0.309950	0.640975	0.584776	0.486712
No of Obs	219	219	219	219
Hausman test				
Dependent variable total risk	**Chi 2 (3)**		**Prob < Chi 2**	
	21.842344		0.0001	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

In the PLS model, R square equals 12% which means that the independent variables explain only 12% of the dependent variable and the model is statically accepted at level of significance equals to 5% according to fisher statistic. The results show that the effect of derivatives on credit risk is not significant. The bank size affects negatively credit risk at level of significance equals to 1%. This revealed that the large the banks are the less credit risks they face. While, net interest margin effect on credit risk is positive at level of significance equals to 1%. This result means that the increase in banks performance leads to an increase in credit risks in banks. **(See appendix 97)**

The fixed model is accepted at level of significance equals to 5% according to fisher statistic, and R square has improved to 54%. The results show that derivatives instruments affect negatively credit risk in banks at level of significance equals to 10%, which means that the use of derivatives in banks for hedging purposes decrease their credit risks. For the bank size effect on credit risk, it is positively significant at 1% level of significance. This result reveals that the size of banks influences positively the risks. Hence, larger banks are more risky than small banks. As concerning net interest margin, its effect on credit risk remains the same positive effect at the same level of significance comparing to the previous model. **(See appendix 98)**

Although R square in the DFE model is 61% and the model is statically accepted according to fisher statistic, the effect derivatives instruments and bank size on credit risk is not comprehensible and cannot be interpreted due to the insignificance of their coefficients, while the effect of net interest margin is positive and significant at 1% like the previous models. **(See appendix 99)**

The random effect model is statically significant according to fisher statistic and R square decreases to 11%. The effect of derivatives is negative on credit risk and significant at 5% level of significance, which means that using derivatives instruments decrease credit risk in our sample banks. Hence, their use is for hedging purposes. Moreover, net interest margin effect on credit risk is always positive and significant at 1% level of significance. For the variable bank size, its effect on credit risk is not clear. **(See appendix 100)**

From Hausman test, Chi square equals to 21.84 for the dependent variable credit risk and as the probability is less than 5% we reject the null hypothesis and accept the alternative hypothesis stipulating that the fixed effects models are the appropriate models. **(See appendix 101)**

II.2.7.2. Specification tests results

II.2.7.2.A. Matrix of correlation

The correlations between variables of the fourth model are presented in the following matrix.

Table (3.117): Matrix of correlations (Credit risk is the dependent variable)

	Derivatives	Size	NIM	Constant
Derivatives	1.0000			
Size	-0.3510	1.0000		
NIM	0.1172	0.0509	1.0000	
Constant	0.1370	-0.8293	-0.5816	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.118): Multicollinearity test results of the fourth model

	VIF	1/VIF
Derivatives	1.16	0.858547
Size	1.15	0.868249
NIM	1.02	0.976621
Mean VIF	1.11	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

II.2.7.2.B. Heteroscedasticity test

The table (3.119), the results show the absence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is more than 5% which means we accept the null hypothesis and reject the alternative hypothesis confirming the homosckedasticity of our variables in our model. **(See appendix 102)**

Table (3.119): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P –value
Credit risk	1.56	0.2114

Source: by the author according to Stata16 results

In addition, we run also white test to confirm or reject the heteroskedasticity of our model and the results were as follow:

Table (3.120): White test results for Heteroskedasticity

Dependent variable	Chi 2(9)	P -value
Credit risk	27.46	0.0012

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(for more details see appendix 103)**

II.2.7.2.C. Endogeneity test

The next table provides the results of endogeneity for the fourth model of our study.

Table (3.121): Endogeneity test results (Credit risk as the dependent variable)

Instruments		Chi-sq (1)	P-value
Included	NIM	12.563	0.0004
Excluded	Size		
Included	Size	26.036	0.0000
Excluded	NIM		

Source: by the author according to Stata 16 results

According to the table (3.121), the results show that the p-value of the estimated regressions is less than 5% which means that there is no endogeneity problem in our model. **(For more details see appendix 104)**

II.2.8. Summaries and Discussions

This estimation aims to determine the impact of derivative instruments on credit risk of banks from GCC countries.

From the static panel results, the derivatives instruments effect on banks ‘credit risk is negative and significant. This finding supports the theory stipulating that using derivatives instruments decrease risks in banks and it corroborates the expectations stipulate that the derivatives instruments are hedging tools which are useful to reduce risks of banks.

Additionally, the effect of bank size on the credit risk of banks is not significant. This finding rejects the literature results stipulating that big banks are more risky than small banks size.

For the variable net interest margin, it affects positively the credit risk of banks which is in line with the theory and what it was expected comparing to literature results.

Concluding results suggest that the effect of derivatives instruments on credit risk in banks is negative. Hence, the finding supports the argument stipulates that derivatives usage reduce risks of banks. Hence, our hypothesis is accepted.

The main regression results of our fourth model are presented in table (3.122).

Table (3.122): Credit risk Regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall
Derivatives	NS	-	NS	-	-
Size	-	+	NS	NS	NS
NIM	+	+	+	+	+

Source: by the author depending on Eviews 9 results

Section III. The effect of financial derivatives on banks' cost of equity capital

The current section aims to examine empirically how financial derivatives affect the cost of equity capital of banks. At the beginning we will estimate the cost of equity capital of banks using the methodology of CAPM as it is the most widely used methodology to calculate the cost of equity according to literature such as (Phillips & Cummins, 2005); (King, 2009); (Hearn & Piesse, 2009). Then, after estimating the cost of equity capital of each bank individually we regress our model in order to investigate the relationship between financial derivatives and cost of equity capital in the banking sector.

III.1. The effect of financial derivatives on banks' cost of equity capital

The aim of this analysis is to determine the effect of derivative instruments on banks cost of equity capital. Therefore this section is organized as follow: Data and sample are described, as well as the methodology in first place then estimation results and analysis and lastly summaries and discussions are presented.

III.1.1. Data, Sample and Methodology

III.1.1.1. Data

The Capital Asset Pricing Model was developed by Sharpe (1964), Lintner (1965) and Mossin (1966). The CAPM is a general equilibrium theory that quantifies the trade-off between risk and expected return using a single risk factor. According to (King, 2009) this model is widely used to estimate the cost of equity capital for individual companies as well as a measure of performance for portfolio managers. CAPM is a general equilibrium model that quantifies the relationship between risk and expected return using a single risk factor. In CAPM the nominal cost of equity capital for a bank is linearly determined by the nominal risk free rate and firm-specific risk premium and it is also assumed to follow a simple one-factor model. The formula of CAPM is as follow:

$$E(R_i) = R_f + \beta_{im}\left(E[R_m] - R_f\right) \ldots equation\ (4)$$

Where:
$E(R_i)$ is the expected return (cost of equity) for bank i.
$E[R_m]$ is the expected return on the overall market portfolio.
R_f is the nominal yield on the risk-free asset.
β_{im} is the equity beta that measures the sensitivity of a bank's equity return to the market.
$\varepsilon_{i,t}$ is a purely idiosyncratic shock assumed to be uncorrelated across banks.
$\left(E[R_m] - R_f\right)$ is the equity market risk premium which measures the average annual return that investors may be expected to earn on their equity portfolio relative to the risk-free rate.

In order to obtain cost of equity capital of each banks, according to literature review CAPM model is the most suitable model and widely used (Phillips & Cummins, 2005); (King, 2009); (Hearn & Piesse, 2009); (Beltrame, Grassetti, et al., 2014). Hence, we used the equation (4).

Firstly we calculated the stock return of each bank (for more details see section one), then we estimated each bank expected return. Moreover, the estimated the market return (previously obtained) following the same method. After that, we calculated the beta coefficient of each bank, which represent the systematic risk of each bank in comparison to the market using the equation (2) as previously described in section two.

Furthermore, the risk free rate was obtained from the federal bank which represents the rate of return on long-term (10 years) US government Treasury bond.

Lastly, annual accounting data of each bank were also used in our model as independent variables obtained from Bank Focus data base during the period 2006-2018.

III.1.1.2. Sample

Our sample is composed of 25 banks from GCC countries as described in the first part. **(For more details see table (3.1))**

III.1.1.3. Methodology

Firstly, we begin with the description of the variables used in our fifth model then we set our third hypothesis according to literature.

III.1.1.3.A. Variables description

The used variables in this analysis are described in the following table.

Table (3.123): Variables definition

Variables	Proxy	Definition	References
Dependent variable			
COE	Cost of equity capital	Calculated as described in equation 4.	(Gay et al., 2011); (Ameer et al., 2011); (Coutinho et al., 2012); (Ahmed et al., 2018).
Independent variables			
Derivatives	Derivatives	The notional value of derivatives divided by total assets.	(Gay et al., 2011); (Ameer et al., 2011); (Coutinho et al., 2012); (Ahmed et al., 2018).
Size	Bank size	Natural log of total assets.	(Gay et al., 2011); (Ameer et al., 2011); (Coutinho et al., 2012); (Ahmed et al., 2018).
Leverage	Leverage	The ratio of the total equity divided on total asset	(Gay et al., 2011); (Ameer et al., 2011); (Coutinho et al., 2012); (Ahmed et al., 2018).
Return on Assets (ROA)	Profitability	Net income divided by total assets.	(Coutinho et al., 2012)
Return on Equity		Net income divided by total equity.	(Coutinho et al., 2012)

(ROE)			

Source: by the author depending on literature review

From the table (3.123), the dependent variable is cost of equity capital, while, the independent variables are derivative instruments, bank size, leverage, return on assets and return on equity. The choice of these variables is according to previous studies and literature as described in the previous table.

III.1.1.3.B. Testing hypotheses and expected results

According to the studies of (Gay et al., 2011); (Ahmed et al., 2018), it is expected that the derivative instruments use tend to decrease the cost of equity capital in firms. Hence, our third hypothesis stipulates that the effect of derivative instruments use is negative on cost of equity capital of.

For the variable bank size according to literature and the theory it is known that large banks are less likely to fail comparing to small banks because of the good diversification of their capital. Therefore, a negative relationship is expected between the variable bank size and cost of equity capital (Luzi et al 2004); (Ameer et al 2011). Moreover, the correlation between leverage and cost of equity capital according to (Coutinho et al., 2012) is negative. The theory shows that more leveraged companies take on more financing using debt, which has a cheaper cost than own capital. Furthermore, (Rajan and Zingales 1995); (Frank and Goyal 2009) studies found that the good performance of bank measured using Return on Assets helps to lower the cost of equity capital. Hence, a negative relationship is predicted between ROA and cost of equity capital.

Table (3.124): The predicted relationship between dependent variable and independent variables

Variables	Expected sign	References
Derivatives	-	(Gay et al., 2011); (Ahmed et al., 2018)
Size	-	(Luzi et al 2004); (Ameer et al 2011)
Leverage	-	(Coutinho et al., 2012)
ROA	-	(Rajan and Zingales 1995); (Frank and Goyal 2009)
ROE	?	

Source: by the author depending on literature review results

III.1.2. Empirical analysis

III.1.2.1. Empirical model

The following equation represents the fifth model in our study.

Fifth model:

$$Cost\ of\ equity\ capital_{i,t} = \alpha_0 + \alpha_1 Derivatives_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Leverage_{i,t} + \alpha_4 ROA_{i,t} + \alpha_5 ROE_{i,t} + \varepsilon_{it}$$

Where:
ε_{it}: is the random error.
The other variables are previously defined.

III.1.2.2. Unit root test

According to the table (3.125), the stationarity of the variables is checked using several tests. Trying with individual intercept, then individual intercept and trend and finally without individual intercept and trend. The results are as follow:

Table (3.125): Stationarity test results

Variables	LLC	IPS	ADF	PP	Decision
ROA	-14.2871 (0.0000)	-7.73430 (0.0000)	157.950 (0.0000)	187.147 (0.0000)	Stationary at level
ROE	-19.0264 (0.0000)	-9.01589 (0.0000)	169.983 (0.0000)	198.450 (0.0000)	Stationary at level
Derivatives	-63.0980 (0.0000)	-12.1034 (0.0000)	82.7248 (0.0025)	78.7588 (0.0058)	Stationary at level
Size	-37.6437 (0.0000)	-15.4769 (0.0000)	99.9018 (0.0000)	115.241 (0.0000)	Stationary at level
Leverage	-21.2359 (0.0000)	-12.2931 (0.0000)	154.671 (0.0000)	228.136 (0.0000)	Stationary at level
COE	-10.0281 (0.0000)	-5.23720 (0.0000)	124.848 (0.0000)	141.448 (0.0000)	Stationary at level

Source: by the author depending on Eviews 9 results

According to the results of the above table, the stationarity of all variables is checked since the P value of the majority of tests is closed to 0, which means we reject the null hypothesis of Unit Root at 5 % significance level.

III.1.2.3. Descriptive statistics

The tables below describe the statistical variables used in the model divided according to our sample countries.

Table (3.126): Panel A. descriptive statistics of variables from UAE

UAE

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0085	0,0069	0,0276	0,0001	0,0085	0,7768	2,3887	3,4843
SIZE	5,0697	4,9894	5,6091	4,5825	0,3123	0,1107	1,9212	1,5160
ROA	1,7563	1,9000	2,6300	0,2300	0,5994	-0,8011	2,7722	3,2738
ROE	11,8553	12,2700	17,8700	2,0200	3,5458	-0,7918	3,3206	3,2633
LEVERAGE	0,9998	0,9998	1,0000	0,9996	0,0001	-0,8039	2,6723	3,3657

COE	0,0512	0,0506	0,1744	-0,1049	0,0409	-0,8930	10,6235	76,6346

Source: by the author depending on Eviews 9 results

All variables are normally distributed in UAE except for cost of equity capital according to Jarque-Bera probability, while Skewness is ranging from -0.89 to 0.77 and Kurtosis is also ranging from 1.92 to 10.62. For the variable derivatives ‘average is 0.0085 with a maximum of 0.02 and standard deviation of 0.0085. In addition, the variable size has a maximum of 5.60 and standard deviation of 0.31 with an average of 5.06; while return on assets and return on equity have an average of 1.75 and 11.85 respectively with a standard deviation of 0.59 and 3.54 also respectively. Concerning leverage has an average of 0.99 and its standard deviation is equal to 0.001. Lastly, the variable cost of equity capital has an average of 0.0512 with a standard deviation of 0.0409.

Table (3.127): Panel B. descriptive statistics of variables from Bahrain

Bahrain

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0046	0,0034	0,0211	0,0002	0,0046	1,7711	6,5997	32,9433
SIZE	4,2495	4,3939	6,5755	3,2289	0,7736	1,3594	5,9007	21,0746
ROA	1,1913	1,3150	2,0600	-2,7300	0,8015	-3,7595	19,2098	425,7263
ROE	10,4272	12,3600	18,5600	-39,3900	9,8529	-4,1734	21,8193	565,1143
LEVERAGE	0,9984	0,9995	0,9998	0,9934	0,0018	-1,1991	3,1734	7,2263
COE	-0,0012	-0,0063	0,9159	-0,5170	0,2303	1,8678	11,4711	96,4280

Source: by the author depending on Eviews 9 results

In Bahrain, the results show that all variables are normally distributed according to Jarque-Bera probability while Skewness ranges from -4.17 to 1.86 and Kurtosis is also ranging from 3.17 to 11.47. Derivatives in Bahrain have an average of 0.0046 with a maximum value of 0.0211 and a standard deviation of 0.0046. For the variable size it has an average of 4.24 and standard deviation of 0.77 while maximum value is equal to 6.57. In addition, return on assets and return on equity have an average of 1.19 and 10.42 respectively, while leverage standard deviation is 0.0018 and its standard deviation is 0.99. for cost of equity capital average is -0.0012 while its standard deviation is 0.2303.

Table (3.128): Panel C. descriptive statistics of variables from Kuwait

Kuwait

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0003	0,0002	0,0008	0,0000	0,0003	0,2922	1,3065	1,4711
SIZE	3,8373	3,5915	4,3729	3,3899	0,4194	0,1863	1,1817	1,5790
ROA	1,4418	1,3700	2,2900	0,9800	0,4025	0,9971	3,1304	1,8306
ROE	11,5282	12,2300	14,0100	9,1500	1,9935	-0,0196	1,2346	1,4292
LEVERAGE	0,9977	0,9976	0,9994	0,9956	0,0015	-0,2102	1,4551	1,1748
COE	0,0357	0,0304	0,0567	0,0219	0,0110	0,9234	2,5985	1,6371

Source: by the author depending on Eviews 9 results

In Kuwait all variables are normally distributed according to Jarque-Bera results and Skewness ranges from -0.21 to 0.99 while Kurtosis ranges from 1.18 to 3.13. The average of derivatives is 0.003 with a maximum of 0.008 and standard deviation of 0.003. For the variable size the maximum value is 4.37 while the standard deviation is equal to 0.41 with an average of 3.83. In addition, return on assets and return on equity have an average of 1.44 and 11.52 respectively. For leverage standard deviation is 0.0015 with an average of 0.99. Lastly, the average of cost of equity is equal to 0.0357 with a standard deviation of 0.0110.

Table (3.129): Panel D. descriptive statistics of variables from Qatar

Qatar

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0017	0,0006	0,0098	0,0000	0,0022	2,0455	7,1962	41,5007
SIZE	4,8713	4,7960	5,7313	4,2534	0,4335	0,5973	2,4120	2,1420
ROA	2,1355	2,2500	2,8800	1,1600	0,4894	-0,4872	2,4068	1,5727
ROE	15,0048	14,8700	25,4800	8,1900	4,4525	0,3283	2,3312	1,0613
LEVERAGE	0,9997	0,9998	1,0000	0,9992	0,0002	-0,8932	2,8858	3,8720
COE	0,0455	0,0482	0,0764	-0,0150	0,0217	-0,7633	3,5202	3,1434

Source: by the author depending on Eviews 9 results

According to The results, Jarque-Bera indicates that all variables are normally distributed except for derivatives in Qatar. As for Skewness it is ranging from -0.89 to 2.04 and Kurtosis is also ranging from 2.33 to 7.19. Concerning the variable derivatives in Qatar it has an average of 0.0017 with a maximum of 0.0098 and a standard deviation of 0.0022; while the variable size standard deviation is equal to 0.43 with a maximum of 5.7 and an average of 4.87. Moreover, return on assets and return on equity have an average of 2.13 and 15.00 respectively; while leverage its average is 0.99 with a standard deviation of 0.002. For cost of equity average, it is equal to 0.0455 while its standard deviation is 0.0217.

Table (3.130): Panel E. descriptive statistics of variables from Saudi Arabia

Saudi Arabia

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0113	0,0118	0,0345	0,0009	0,0097	0,7439	2,6133	3,5443
SIZE	5,1664	5,2311	5,3715	4,7117	0,1732	-1,3287	4,0145	12,1370
ROA	1,9331	1,9300	2,3800	0,8700	0,3457	-0,8499	3,6450	4,9576
ROE	13,4797	13,5500	18,4300	5,6500	2,7796	-0,4121	3,3629	1,2165
LEVERAGE	0,9999	0,9999	0,9999	0,9997	0,0001	-2,5434	8,4121	82,7500
COE	0,0444	0,0464	0,0578	0,0190	0,0099	-0,5380	2,4866	2,1318

Source: by the author depending on Eviews 9 results

For Saudi Arabia results the variables are normally distributed according to Jarque-Bera except for size. Skewness ranges from -2.54 to 0.74 while Kurtosis ranges also from 2.48 to 8.41. The average of derivatives in Saudi Arabia banks is equal to 0.0113 with a maximum of 0.0345 and a standard deviation of 0.0097; for size the average is 5.16 with a standard deviation of 0.17 and a maximum of 5.37. Moreover, return on assets and return on equity averages are 1.93 and 12.47 respectively, while leverage average is 0.99. The average value of cost of equity is 0.0444 with a standard deviation of 0.009.

Table (3.131): Panel F. descriptive statistics of variables from Oman

Oman

Variables	Mean	Median	Max	Min	Std, Dev,	Skewness	Kurtosis	Jarque-Bera
DERIVATIVES	0,0020	0,0017	0,0067	0,0000	0,0019	0,8872	3,0068	2,4927
SIZE	3,5084	3,4045	4,0985	2,9868	0,3199	0,4095	2,0376	1,2643
ROA	1,4716	1,7100	2,0400	0,3400	0,5437	-1,2055	2,8420	4,6214
ROE	11,4058	13,2200	14,6600	2,8400	4,1983	-1,3105	2,9004	5,4462
LEVERAGE	0,9950	0,9952	0,9991	0,9879	0,0031	-0,6383	2,8048	1,3204
COE	0,0456	0,0397	0,1235	0,0102	0,0280	1,0704	4,2363	4,8381

Source: by the author depending on Eviews 9 results

Oman results indicate that all variables were normally distributed according to Jarque-Bera and Skewness ranges from -1.31 to 1.07 while Kurtosis ranges from 2.03 to 4.23.

For the variable derivatives maximum value is 0.0067 with an average of 0.0020 and a standard deviation of 0.0019. Concerning the variable size' average is 3.50 with a maximum of 4.09 and a standard deviation of 0.31. Additionally, the averages of both return on assets and return on equity are 1.47 and 11.40 respectively. In addition, the average of leverage is 0.99. Lastly, for cost of equity average, it is 0.0456 while its standard deviation is equal to 0.0280.

As a conclusion, UAE banks are the most users of derivative instruments in GCC countries with a standard deviation of 0.0085. Moreover, the Saudi Arabian banks are the larger banks while the smallest banks are Kuwait banks. As for performance indicators return on assets and return on equity, the highest performance of banks is in Qatar commercial banks with a score of 25.48 as a maximum value for ROE following by Bahrain, Saudi Arabia, UAE and lastly Oman. However, the risk was higher in Bahrain banks and its lowest was in Kuwait banks. The indicator ROA shows that Qatar banks are the most well performed banks with a score of 2.88 followed by UAE, Saudi Arabia, Kuwait, Bahrain and Oman. As for the risk, it was higher in Bahrain banks and lower in Saudi Arabia banks.

Furthermore, the highest level of leverage is in UAE banks followed by Saudi Arabia, Qatar, Bahrain, Kuwait and lastly Oman. However, the risk was higher in Oman banks and lower in UAE and Saudi Arabia.

Finally, the maximum level of cost of equity capital was in Bahrain banks with a score of 0.9158 followed by UAE, Oman, Qatar, Saudi Arabia and lastly Kuwait, while the risk was higher in Bahrain with a score of 0.2303 and lower in Saudi Arabia banks with a score of 0.0099.

III.1.3. Regression analysis

III.1.3.1. Static Panel analysis

The estimation results of the fifth model are summarized in table (3.132).

Table (3.132): Estimation outputs of the fifth model

Independent Variable	Method of estimation			
	PLS	FEM	DFE	REM
C	3.255779	-5.266099	-7.739580	3.255779

	(0.443912)ns	(-0.286273)ns	(-0.404148)ns	(0.407488)ns
Derivatives	0.161368 (0.129052)ns	0.003258 (0.001109)ns	-0.232750 (-0.075452)ns	0.161368 (0.118463)ns
Size	0.010225 (0.426269)ns	-0.117147 (-0.820807)ns	-0.281414 (-0.872977)ns	0.010225 (0.391293)ns
Leverage	-3.276251 (-0.441053)ns	5.862273 (0.413765)ns	9.128262 (0.460595)ns	-3.276251 (-0.404864)ns
ROA	0.026620 (0.854777)ns	0.024256 (0.413765)ns	-0.022152 (-0.315188)ns	0.026620 (0.784642)ns
ROE	-0.002931 (-0.711526)ns	-0.003770 (-0.441763)ns	0.000595 (0.064630)ns	-0.002931 (-0.653145)ns
Log likelihood	124.1285	125.7566	127.3006	-
S.E	0.103158	0.112378	0.113731	0.103158
R^2	0.009395	0.031851	0.052678	0.009395
F statistic	0.257960ns	0.127058ns	0.174998ns	0.257960ns
DW	1.688390	1.721275	1.726818	1.688390
No of Obs	142	142	142	142
Hausman test				
Dependent variable cost of equity capital	**Chi 2 (5)**		**Prob < Chi 2**	
	0.944728		0.9669	

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

All models are rejected according to fisher statistic. **(See appendix 105, 106, 107 and 108)**

III.1.3.2. Specification tests results

III.1.3.2.A. Matrix of correlation

The following table represents the correlations between variables of the fifth model.

Table (3.133): Matrix of correlations (Cost of equity capital is the dependent variable)

	Derivatives	Size	Leverage	ROA	ROE	Constant
Derivatives	1.0000					
Size	-0.3433	1.0000				
Leverage	0.0946	-0.7781	1.0000			
ROA	0.0804	-0.2321	-0.0045	1.0000		
ROE	0.0018	0.1203	0.0046	-0.8281	1.0000	
Constant	-0.0921	0.7732	-1.0000	0.0065	-0.0075	1.0000

Source: by the author according to Stata 16 results

Furthermore, a test for multicollinearity is made using the variance inflation factor (VIF). The results are presented in the following table:

Table (3.134): Multicollinearity test results of the fifth model

	VIF	1/VIF
Size	3.76	0.265927
ROA	3.74	0.267324
ROE	3.35	0.298909
Leverage	3.16	0.316641
Derivatives	1.25	0.798439
Mean VIF	3.05	

Source: by the author according to Stata16 results

The results show an absence of correlation between the independents variables since the variance inflation factors are less than 5.

III.1.3.2.B. Heteroscedasticity test

The table (3.135) provides the results of heteroskedasticity test.

Table (3.135): Breusch-Pagan Heteroskedasticity test results

Dependent variable	Chi 2(1)	P –value
Cost of equity capital	20.45	0.0000

Source: by the author according to Stata16 results

From the above table, the results show the existence of heteroskedasticity problem according to the p-value of Breusch-Pagan test where it is less than 5% which means we reject the null hypothesis and accept the alternative hypothesis confirming the problem of heteroskedasticity in our model. **(See appendix 109)**

In addition, we run also white test to confirm the heteroskedasticity of our model and the results were as follow:

Table (3.136): White test for Heteroskedasticity

Dependent variable	Chi 2(20)	P –value
Cost of equity capital	36.13	0.0149

Source: by the author according to Stata16 results

Hence, according to the p value of white test we reject the null hypothesis and accept the alternative hypothesis confirming the existence of heteroskedasticity in our model. **(See appendix 110)**

III.1.3.2.C. Endogeneity test

The following table provides the results of endogeneity test of the fofth model.

Table (3.137): Endogeneity test results (Cost of equity capital as the dependent variable)

Instruments		Chi-sq (1)	P-value
Included	Leverage, ROA, ROE	0.700	0.4029
Excluded	Size		
Included	Size, ROA, ROE.	0.102	0.7491
Excluded	Leverage		

Included	Size, leverage, ROE	0.179	0.6726
Excluded	ROA		
Included	Size, leverage, ROA	0.204	0.6519
Excluded	ROE		

Source: by the author according to Stata 16 results

According to the results of table (3.137), the p-value of all estimated regressions is higher than 5% which means that there is an endogeneity problem in our model. **(For more details see appendix 111)**

According to the previous tests results, there exist heteroskedasticity and endogeneity in our model in addition to the fact that the number of banks (groups) is greater than the number of the time period. Consequently, it is necessary to apply GMM estimator as an appropriate method of estimation to have a better results.

III.1.3.3. GMM Panel analysis

The next table represents the results of estimation of our fifth model using GMM.

Table (3.138): Estimation outputs using GMM of the fifth model (Cost of equity capital as the dependent variable)

Variables	COE
COE (-1)	0.232693 (64.05107)***
Derivatives	-9.759452 (-33.73879)***
Size	-0.145733 (-2.894988)***
Leverage	2.396839 (0.756959)ns
ROA	-0.060711 (-4.067550)***
ROE	0.006615 (2.868717)***
Num of Obs	98
Hansen test (J-statistic)	14.13925
P-value of Hansen test	0.117457
Arrellano & Bond test AR (1)	-1.115127
P-value of AR (1)	0.2648
Arrellano & Bond test AR (2)	1.026844
P-value of AR (2)	0.3045

Source: by the author depending on Eviews 9 results

*, **, and *** significance level at 10%, 5% and 1% level respectively.

( ): t-statistic of the estimators.

Ns: not significant.

The p-value of Hansen J statistic is higher than 5% so we accept the null hypothesis that implies that the model is well fit and it confirms the validity of the instruments of our model. Additionally, the results of autocorrelation test of the error term show that the p value of the second order serial correlation AR (2) is higher than 5%. This finding implies that the original error term is serially uncorrelated therefore the moment conditions are correctly specified. **(See appendix 112 and 113)**

The significance of the lagged value of dependent variable approves the application of the GMM model. Moreover, the results indicate that the effect of derivative instruments is negative on cost of equity capital of banks at level of significance equals to 1%. This means that the use of derivatives instruments in banks tends to reduce their cost of equity capital.

Moreover, the negative effect of bank size on cost of equity capital at level of significance equals to 1%, meaning that large banks have lower cost of equity capital comparing to small banks which is in line with the theory. Furthermore, the profitability indicator represented in return on asset has a negative and significant effect on cost of equity of banks at level of significance equals to 1%. This result reveals that the higher the bank performance the lower cost of equity it has, while return on equity affect positively cost of equity at level of significance equals to 1%. This finding means that the increase in return on equity in banks is at the same time as the increase in their cost of equity capital.

III.1.4. Summaries and Discussions

This analysis aims to determine the impact of derivative instruments on cost of equity capital of banks from GCC countries.

The significance of the lagged value of the dependent variable confirms the validation of the GMM model. Concerning the effect of derivatives on cost of equity capital of banks, it is negative. This result is in line with the literature and it can be interpreted that although our sample banks have a small derivatives markets comparing to the developed countries, they manage their use of derivatives instruments in order to lower their cost of equity capital.

For the bank size negative effect on cost of equity capital, this finding corroborate the theory stipulating that the size of banks influences negatively banks cost of equity capital. The theory suggests that large banks are well diversified than small banks; hence the chance of their fail is less comparing to smaller banks. Thereby, the requested rate of return asked by the investors is less.

Return on assets affect negatively cost of equity capital in our sample banks. This means that the increase in the bank's performance will decrease their risks, thus the investors requested return will be lower comparing to banks that have lower performance. This finding is in line with the literature results. However, the effect of return on equity is positive, which means that the return on equity and the cost of equity capital are affected by the same effect when using financial derivatives. Finally, the effect of leverage on banks cost of equity is not significant. Consequently, it cannot be interpreted and cannot support or reject the theory stipulating that leverage affect negatively the cost of equity capital.

In summary, the finding suggests that banks that use derivatives instruments have lower cost of equity capital than banks that do not use derivatives instruments. Hence, banks seem to reduce their cost of equity capital by using derivative instruments. This result is similar to literature findings and the argument that stipulate that derivatives usage decrease cost of equity capital of banks. Hence, our third hypothesis is accepted.

The main regression results of our fifth model are summarized in the table (3.139).

Table (3.139): Cost of equity capital Regression coefficient signs summary

Variable	PLS	FEM	DFE	REM	Overall	GMM
Derivatives	NS	NS	NS	NS	NS	-
Size	NS	NS	NS	NS	NS	-
Leverage	NS	NS	NS	NS	NS	NS
ROA	NS	NS	NS	NS	NS	-
ROE	NS	NS	NS	NS	NS	+

Source: by the author depending on Eviews 9 results

Conclusion

This chapter of thesis has the aim to study the effect of derivative instruments use on bank performance, risk and cost of equity capital. Thus, three sections have been carried out in order to attain this end.

After analyzing the pooled data of 25 banks from GCC countries during the period 2006 to 2018 noteworthy conclusions drawn from the empirical results, generally the use of financial derivatives reduce both the financial and accounting performance of banks. Additionally, overall results show that banks are reducing their capital market risks and accounting risks by using financial derivatives. Lastly, banks that use derivatives have lower cost of equity capital.

Conclusion

Conclusion

The purpose of the thesis is to study the effect of derivative instruments use by commercial banks in GCC countries on their cost of equity capital. For that, we have chosen a sample composed of 25 commercial banks from GCC countries for many reasons such as: the lack of papers focusing on emerging countries, the lack of data on banks from emerging countries and the limited number of papers analyzing empirically the relationship between financial derivatives usage and cost of capital in general.

Using annual accounting data in the period 2006-2018 and daily market data during the period 2010-2018, this thesis tries to respond to the following main research questions:
What is the effect of financial derivatives usage on the performance of commercial banks?
Are commercial banks decreasing their risks by using financial derivatives?
Does the financial derivatives usage reduce cost of equity capital of commercial banks?

To provide answers, we conducted three chapters. The first chapter was deduced to theoretical framework, the second chapter presented literature review and the last chapter presented the empirical analyses.

In the first section of the empirical study, the aim is to analyze the effect of financial derivatives usage on banks financial and accounting performance.

According to the literature results the main hypothesis is that financial derivatives usage affect positively the performance of banks. To test this hypothesis, we conducted an empirical analysis defined in two analyses, where the performance of banks is regressed to derivatives and other variables.

In the first analysis, the financial performance of banks is measured by stock return.

Using a sample of 25 banks from 6 GCC countries during the period 2006 to 2018, the results show that the use of financial derivatives decreases the financial performance of banks.

The second analysis is testing the effect of derivatives use on accounting performance. Accounting performance are defined by return on assets, return on equity, net interest margin and cost to income ratio.

The same sample is used in this part of analysis covering the period from 2006 to 2018.

The whole findings reveal that in general the use of derivatives instruments tends to decrease the accounting performance of banks. Our results are not similar to the majority of those of the literature as described previously. Regarding literature (see Rivas, Ozuna, & Policastro, 2011; Au Yong, Faff, & Chalmers, 2014; Said, 2011; Egly & Sun, 2014; Shen & Hartarska, 2018; Keffala, 2019), this result is not in line with most of previous studies results although some studies did find that the usage of derivatives instruments reduce performance such as (Minton, Stulz, & Williamson, 2009; Brewer, Deshmukh, & Opiela, 2014; M. Keffala, 2012; M. Keffala, 2015).

The main conclusion of the first section of our empirical study reveals that the use of financial derivatives does not increase both the financial and accounting performance of banks.

Hence, the hypothesis stipulating that financial derivatives usage affect positively the performance of banks is not supported. Contrary to the previous studies results, this result can be interpreted by the fact that banks from emerging countries are new users of derivative instruments which make their experience limited in using these instruments in addition to their small derivatives markets which do not offer many opportunities to take profits if derivative instruments. These specificities of our sample changed the results comparing to previous studies results which were mostly studies on advanced countries, where it seems clearly that their banks manage better the use of financial derivatives in comparison to banks from emerging countries.

The second section examines the effect of financial derivatives usage on banks' capital market risks and accounting risks.

Regarding previous papers investigating empirically the relationship between financial derivatives and banks' risks, the major hypothesis is that overall the use of derivatives instruments except for options affect negatively the bank risks.

In order to check up this hypothesis, the second section was divided to two analyses.

The first analysis was deduced to test empirically the relationship between financial derivatives and capital market risks. Capital market risk is measured by total risk, systematic risk and specific risk.

The sample is composed of 25 commercial banks covering the period 2006 to 2018. The findings show that the use of financial derivatives reduces the capital market risks of banks.

The second analysis examines the impact of financial derivatives in accounting risks of banks. Leverage risk, liquidity risk and credit risk are used as measures of accounting risks.

After analysis, the empirical results indicate that in general the effect of financial derivatives usage on the accounting risk is negative.

These findings are similar to the previous literature (Brewer lii, Minton, & Moser, 2000; Minton, Stulz, & Williamson, 2005; Au Yong, Faff, & Chalmers, 2009; Shiu & Shin 2010; Norden, Buston, & Wagner, 2011; Gonzalez, Gil, Agra, & Santomil, 2015; Kouser, Mahmood, Aamir, & Bano, 2016; Zakaria, 2017). Hence, there is evidence that the use of financial derivatives reduce banks risk in emerging countries. Thus, the hypothesis stipulating that financial derivatives usage decrease risks of banks is supported. These results can be explained by the fact that banks of our sample are using financial derivatives as hedging tools. Therefore, it seems that banks of our sample are not at risk when using derivative instruments.

The aim of the third section is to analyze how cost of equity capital is affected by the use of financial derivatives. After an analysis of 25 banks from 2006 to 2018, the findings indicate that the use of financial derivatives by commercial banks lowers their cost of equity capital. This result is similar to those of the literature (Gay, Lin, & Smith, 2011; Coutinho, Sheng, & Lora, 2012; Ahmed, Judge, & Mahmud, 2018) although these latters focused on non-financial firms. Hence, the hypothesis stipulating that the use of financial derivatives reduces cost of equity capital is accepted. This finding makes evidence that the use of derivative instruments by banks properly improve the banks' image to investors, which give them the safety feeling and thereby the asked return on equity is less comparing to banks that do not use financial derivatives.

From this work, we can summarize the following implications.

From the first section, the results exhibit that the use of financial derivatives does not improve the performance of banks. Therefore, bank managers should give more attention to their use of derivative instruments to control its effect on the performance of banks.

From the second section, it seems that banks of our sample use financial derivatives for hedging purposes due to the negative effect of these instruments on risks of banks. Thereby, managers of banks should benefit from the profit of derivative instruments and use these latters as hedging tools.

From the third section, the findings demonstrate a negative relationship between derivative instruments and cost of equity capital. Thus, the proper use of derivatives by bank managers is beneficial for bank. Because of the good management of bank, its performance will be better and thereby the required return of investors will be reduced.

In brief, deducing results show that by using financial derivatives commercial banks decrease their performance and also their risk, indeed their cost of equity capital is lower.

Our thesis contributions can be enumerated: firstly, our study focuses on emerging countries contrary to the majority of previous papers focusing only on banks from advanced countries mainly from US. Secondly, contrary to previous studies, our thesis analyzed the effect of derivative instruments on cost of equity capital in commercial banks empirically. Indeed, it contributes to the literature by studying this relation in financial firms in order to fill this gap in the literature.

Nevertheless, the current work was limited by some constraints such as the lack of derivatives and market data. The lack of market data limited our methodology in estimating cost of equity capital in addition to the lack of empirical references concerning the association between financial derivatives and cost of equity capital especially in financial institutions.

As proposals, forthcoming studies should focus on:

- ✓ Enlarge the period and the sample of the study;
- ✓ Access to more data in order to separate between types of derivatives;
- ✓ Compare banks from emerging countries;
- ✓ Get more market data to estimate cost of equity capital using different models.

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Appendices

Appendix (1): Estimation results using PLS model for the first model (Stock return)

Dependent Variable: STOCK_RETURN
Method: Panel Least Squares
Date: 02/21/20 Time: 07:27
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.040541	0.372775	-0.108755	0.9136
DERIVATIVES	-3.237938	5.198416	-0.622870	0.5344
SIZE	-0.034234	0.061951	-0.552597	0.5814
NIM	0.171412	0.073265	2.339601	0.0208
LIQUIDITY	-1.592426	0.664967	-2.394744	0.0180
CREDIT_RISK	-0.013786	0.023127	-0.596091	0.5521

R-squared	0.084832	Mean dependent var	-0.023302
Adjusted R-squared	0.051186	S.D. dependent var	0.433911
S.E. of regression	0.422660	Akaike info criterion	1.156838
Sum squared resid	24.29526	Schwarz criterion	1.281732
Log likelihood	-76.13551	Hannan-Quinn criter.	1.207590
F-statistic	2.521313	Durbin-Watson stat	2.129498
Prob(F-statistic)	0.032307		

Appendix (2): Estimation results using Fixed effect model for the first model (Stock return)

Dependent Variable: STOCK_RETURN
Method: Panel Least Squares
Date: 02/21/20 Time: 18:32
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.469987	3.083713	-2.098116	0.0381
DERIVATIVES	-2.822016	11.04244	-0.255561	0.7988
SIZE	1.053731	0.588761	1.789743	0.0762
NIM	0.501579	0.166927	3.004785	0.0033
LIQUIDITY	1.304616	1.291656	1.010034	0.3147
CREDIT_RISK	-0.020648	0.045486	-0.453936	0.6508

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.221052	Mean dependent var	-0.023302
Adjusted R-squared	0.019360	S.D. dependent var	0.433911
S.E. of regression	0.429690	Akaike info criterion	1.333703
Sum squared resid	20.67898	Schwarz criterion	1.958173
Log likelihood	-64.69291	Hannan-Quinn criter.	1.587462
F-statistic	1.095988	Durbin-Watson stat	2.321661
Prob(F-statistic)	0.355524		

Appendix (3): Estimation results using Dual fixed effect model for the first model (Stock return)

Dependent Variable: STOCK_RETURN
Method: Panel Least Squares
Date: 02/21/20 Time: 07:37
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.978107	4.629397	-0.859314	0.3921
DERIVATIVES	1.113400	11.40375	0.097635	0.9224
SIZE	0.509114	0.951716	0.534943	0.5938
NIM	0.473541	0.168770	2.805829	0.0060
LIQUIDITY	2.033172	1.382368	1.470789	0.1443
CREDIT_RISK	-0.027595	0.045194	-0.610587	0.5428

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.274191	Mean dependent var	-0.023302
Adjusted R-squared	0.043560	S.D. dependent var	0.433911
S.E. of regression	0.424355	Akaike info criterion	1.333468
Sum squared resid	19.26828	Schwarz criterion	2.062017
Log likelihood	-59.67623	Hannan-Quinn criter.	1.629521
F-statistic	1.188873	Durbin-Watson stat	2.331994
Prob(F-statistic)	0.249495		

Appendix (4): Estimation results using Random effect model for the first model (Stock return)

Dependent Variable: STOCK_RETURN
Method: Panel EGLS (Cross-section random effects)
Date: 02/21/20 Time: 18:41
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.040541	0.378975	-0.106976	0.9150
DERIVATIVES	-3.237938	5.284881	-0.612679	0.5411
SIZE	-0.034234	0.062981	-0.543556	0.5876
NIM	0.171412	0.074484	2.301323	0.0229
LIQUIDITY	-1.592426	0.676028	-2.355563	0.0199
CREDIT_RISK	-0.013786	0.023512	-0.586338	0.5586

Effects Specification

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.429690	1.0000

Weighted Statistics

R-squared	0.084832	Mean dependent var	-0.023302
Adjusted R-squared	0.051186	S.D. dependent var	0.433911
S.E. of regression	0.422660	Sum squared resid	24.29526
F-statistic	2.521313	Durbin-Watson stat	2.129498
Prob(F-statistic)	0.032307		

Unweighted Statistics

R-squared	0.084832	Mean dependent var	-0.023302
Sum squared resid	24.29526	Durbin-Watson stat	2.129498

Appendix (5): Hausman test results for the first model (Stock return)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	11.138025	5	0.0487

Appendix (6): Heterosckedasticity test results for the first model (Stock return) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of StockR

         chi2(1)      =   255.27
         Prob > chi2  =   0.0000
```

Appendix (7): Heterosckedasticity test results for the first model (Stock return) using White test

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(20)     =     36.09
         Prob > chi2  =    0.0150

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	36.09	20	0.0150
Skewness	2.03	5	0.8451
Kurtosis	2.75	1	0.0972
Total	40.87	26	0.0319

Appendix (8): Endogeneity test results for the first model (Stock return)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 StockR (Derivatives=NIM) Size Liquidity CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =       25                Obs per group: min =         4
                                                          avg =       5.7
                                                          max =         6

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      142
                                                      F(  4,   113) =     0.22
                                                      Prob > F      =   0.9271
Total (centered) SS     =  22.50188396                Centered R2   =  -9.3561
Total (uncentered) SS   =  22.50188396                Uncentered R2 =  -9.3561
Residual SS             =  233.0322598                Root MSE      =    1.411

------------------------------------------------------------------------------
      StockR |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |  -377.3109    407.731    -0.93   0.355    -1176.449    421.8271
        Size |  -2.036847   2.935657    -0.69   0.488    -7.790628    3.716935
   Liquidity |    4.33336   5.602562     0.77   0.439    -6.647459    15.31418
     CreditR |  -.1011371   .1845013    -0.55   0.584    -.4627529    .2604787
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           0.918
                                                   Chi-sq(1) P-val =    0.3379
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                0.894
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                               8.728
                                                   Chi-sq(1) P-val =    0.0031
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: Size Liquidity CreditR
Excluded instruments: NIM
------------------------------------------------------------------------------
```

Appendix (9): Estimation results using GMM model for the first model (Stock return)

Dependent Variable: STOCK_RETURN
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 02/21/20 Time: 07:52
Sample (adjusted): 2012 2015
Periods included: 4
Cross-sections included: 25
Total panel (unbalanced) observations: 98
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(STOCK_RETURN,-2) DERIVATIVES SIZE
NIM LIQUIDITY CREDIT_RISK

Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
STOCK_RETURN(-1)	-0.029744	0.011873	-2.505285	0.0140
DERIVATIVES	-12.82598	2.612148	-4.910127	0.0000
SIZE	1.548130	0.308469	5.018747	0.0000
NIM	0.538759	0.103862	5.187282	0.0000
LIQUIDITY	1.448115	0.395075	3.665417	0.0004
CREDIT_RISK	-0.017794	0.018872	-0.942880	0.3482

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.006442	S.D. dependent var	0.656784
S.E. of regression	0.646708	Sum squared resid	38.47731
J-statistic	15.30102	Instrument rank	15
Prob(J-statistic)	0.082992		

Appendix (10): Arrellano-Bond serial correlation test results for the first model (Stock return)

Arellano-Bond Serial Correlation Test
Equation: EQ01
Date: 03/01/20 Time: 10:42
Sample: 2005 2018
Included observations: 98

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.513397	-14.300226	9.449093	0.1302
AR(2)	0.920062	3.985226	4.331475	0.3575

Appendix (11): Estimation results using PLS model for the second model (ROA)

Dependent Variable: ROA
Method: Panel Least Squares
Date: 02/21/20 Time: 18:28
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	65.17003	41.50731	1.570086	0.1179
DERIVATIVES	-11.47883	6.342014	-1.809965	0.0717
SIZE	0.458987	0.151177	3.036090	0.0027
LEVERAGE	-65.96405	42.04985	-1.568711	0.1182
LIQUIDITY	2.120959	0.896784	2.365072	0.0189
LOAN	1.106522	0.629677	1.757285	0.0803
CREDIT_RISK	-0.141517	0.032312	-4.379741	0.0000

R-squared	0.143841	Mean dependent var	1.927671
Adjusted R-squared	0.119610	S.D. dependent var	0.830967
S.E. of regression	0.779689	Akaike info criterion	2.371597

Sum squared resid	128.8778	Schwarz criterion	2.479924
Log likelihood	-252.6899	Hannan-Quinn criter.	2.415347
F-statistic	5.936271	Durbin-Watson stat	0.617294
Prob(F-statistic)	0.000009		

Appendix (12): Estimation results using fixed effect model for the second model (ROA)

Dependent Variable: ROA
Method: Panel Least Squares
Date: 02/21/20 Time: 18:29
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	70.27306	47.00228	1.495099	0.1366
DERIVATIVES	-20.15418	7.788853	-2.587567	0.0104
SIZE	-2.316679	0.410224	-5.647350	0.0000
LEVERAGE	-56.33386	47.86353	-1.176968	0.2407
LIQUIDITY	-0.448232	1.108196	-0.404470	0.6863
LOAN	-1.530836	1.173631	-1.304358	0.1937
CREDIT_RISK	-0.063218	0.032251	-1.960177	0.0515

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.596110	Mean dependent var	1.927671
Adjusted R-squared	0.531660	S.D. dependent var	0.830967
S.E. of regression	0.568675	Akaike info criterion	1.839462
Sum squared resid	60.79766	Schwarz criterion	2.319193
Log likelihood	-170.4211	Hannan-Quinn criter.	2.033211
F-statistic	9.249116	Durbin-Watson stat	1.158016
Prob(F-statistic)	0.000000		

Appendix (13): Estimation results using dual fixed effect model for the second model (ROA)

Dependent Variable: ROA
Method: Panel Least Squares
Date: 02/21/20 Time: 18:30
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	39.65993	40.69734	0.974509	0.3311
DERIVATIVES	-12.56666	6.941195	-1.810446	0.0719
SIZE	-2.252432	0.609747	-3.694043	0.0003
LEVERAGE	-26.82109	41.32257	-0.649066	0.5171
LIQUIDITY	0.526051	0.976327	0.538806	0.5907
LOAN	-0.675997	1.072874	-0.630080	0.5294
CREDIT_RISK	-0.037871	0.030904	-1.225433	0.2220

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.717432	Mean dependent var	1.927671
Adjusted R-squared	0.655867	S.D. dependent var	0.830967
S.E. of regression	0.487469	Akaike info criterion	1.564432
Sum squared resid	42.53509	Schwarz criterion	2.183440
Log likelihood	-131.3053	Hannan-Quinn criter.	1.814431
F-statistic	11.65321	Durbin-Watson stat	1.365660
Prob(F-statistic)	0.000000		

Appendix (14): Estimation results using random effect model for the second model (ROA)

Dependent Variable: ROA
Method: Panel EGLS (Cross-section random effects)
Date: 02/21/20 Time: 18:30
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	94.70933	41.40930	2.287151	0.0232
DERIVATIVES	-11.44544	6.865783	-1.667026	0.0970
SIZE	0.272989	0.192128	1.420869	0.1568
LEVERAGE	-93.77806	42.01365	-2.232086	0.0267
LIQUIDITY	2.489212	0.920166	2.705177	0.0074
LOAN	-0.620212	0.838017	-0.740094	0.4601
CREDIT_RISK	-0.114557	0.029473	-3.886824	0.0001

Effects Specification

	S.D.	Rho
Cross-section random	0.459642	0.3951
Idiosyncratic random	0.568675	0.6049

Weighted Statistics

R-squared	0.099959	Mean dependent var	0.731192
Adjusted R-squared	0.074487	S.D. dependent var	0.663479
S.E. of regression	0.640153	Sum squared resid	86.87672
F-statistic	3.924157	Durbin-Watson stat	0.886762
Prob(F-statistic)	0.000968		

Unweighted Statistics

R-squared	0.039489	Mean dependent var	1.927671
Sum squared resid	144.5860	Durbin-Watson stat	0.532824

Appendix (15): Hausman test results for the second model (ROA)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.

Cross-section random	63.915474	6	0.0000

Appendix (16): Heterosckedasticity test results for the second model (ROA) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ROA

         chi2(1)      =    11.69
         Prob > chi2  =   0.0006
```

Appendix (17): Heterosckedasticity test results for the second model (ROA) using White test

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     28.14
         Prob > chi2  =    0.4039

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	28.14	27	0.4039
Skewness	2.84	6	0.8283
Kurtosis	2.20	1	0.1379
Total	33.18	34	0.5076

Appendix (18): Endogeneity test results for the second model (ROA)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 ROA (Derivatives=Size) Leverage Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                Obs per group: min =         4
                                                           avg =       8.8
                                                           max =        10

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      219
                                                      F(  5,   189) =     0.26
                                                      Prob > F      =   0.9352
Total (centered) SS     =  87.07531111                Centered R2   = -39.5175
Total (uncentered) SS   =  87.07531111                Uncentered R2 = -39.5175
Residual SS             =  3528.069887                Root MSE      =    4.264

------------------------------------------------------------------------------
         ROA |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   786.3432   1069.337     0.74   0.462    -1309.519    2882.205
    Leverage |   120.4336    508.426     0.24   0.813    -876.0631     1116.93
   Liquidity |  -1.641576   9.001876    -0.18   0.855    -19.28493    16.00178
        Loan |   .2475721   9.320565     0.03   0.979     -18.0204    18.51554
     CreditR |   .5500372   .9068242     0.61   0.544    -1.227305     2.32738
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           0.577
                                                   Chi-sq(1) P-val =    0.4475
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                0.564
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                              28.137
                                                   Chi-sq(1) P-val =    0.0000
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: Leverage Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------
```

Appendix (19): Estimation results using GMM model for the second model (ROA)

Dependent Variable: ROA
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/01/20   Time: 17:54
Sample (adjusted): 2008 2015
Periods included: 8
Cross-sections included: 25
Total panel (unbalanced) observations: 176
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(ROA,-2) DERIVATIVES SIZE LEVERAGE
LIQUIDITY LOAN CREDIT_RISK

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	0.377628	0.057166	6.605845	0.0000
DERIVATIVES	-18.99363	5.919714	-3.208539	0.0016
SIZE	0.140361	0.255193	0.550020	0.5830
LEVERAGE	-176.7419	39.79644	-4.441147	0.0000
LIQUIDITY	-0.468860	0.546103	-0.858556	0.3918
LOAN	-2.659614	0.411678	-6.460426	0.0000
CREDIT_RISK	-0.047731	0.025117	-1.900349	0.0591

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.086648	S.D. dependent var	0.539216
S.E. of regression	0.590588	Sum squared resid	58.94617
J-statistic	22.37361	Instrument rank	25
Prob(J-statistic)	0.215819		

Appendix (20): Arrellano-Bond serial correlation test results for the second model (ROA)

Arellano-Bond Serial Correlation Test
Equation: EQ02
Date: 03/01/20 Time: 18:02
Sample: 2005 2018
Included observations: 176

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.301477	-23.991483	18.434047	0.1931
AR(2)	0.420694	2.463724	5.856328	0.6740

Appendix (21): Estimation results using PLS model for the second model (ROE)

Dependent Variable: ROE
Method: Panel Least Squares
Date: 02/22/20 Time: 09:23
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	314.4461	432.3284	0.727332	0.4678
DERIVATIVES	-42.91807	68.59141	-0.625706	0.5322
SIZE	2.231541	1.785063	1.250119	0.2126
LEVERAGE	-316.2156	441.3256	-0.716513	0.4745
LIQUIDITY	16.53335	9.145952	1.807723	0.0721
LOAN	11.42413	12.46947	0.916168	0.3606
CREDIT_RISK	-1.265201	0.393933	-3.211718	0.0015

R-squared	0.120232	Mean dependent var	14.57776
Adjusted R-squared	0.095333	S.D. dependent var	7.111043
S.E. of regression	6.763595	Akaike info criterion	6.692428
Sum squared resid	9698.197	Schwarz criterion	6.800754
Log likelihood	-725.8208	Hannan-Quinn criter.	6.736177

F-statistic	4.828791	Durbin-Watson stat	0.855163
Prob(F-statistic)	0.000121		

Appendix (22): Estimation results using fixed effect model for the second model (ROE)

Dependent Variable: ROE
Method: Panel Least Squares
Date: 02/22/20 Time: 09:23
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
White period standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-259.4901	319.0501	-0.813321	0.4171
DERIVATIVES	-121.4683	54.14135	-2.243541	0.0260
SIZE	-19.90794	5.728353	-3.475334	0.0006
LEVERAGE	371.7476	342.9876	1.083851	0.2798
LIQUIDITY	7.841104	17.52486	0.447428	0.6551
LOAN	-6.262675	18.96099	-0.330293	0.7415
CREDIT_RISK	-0.599141	0.369337	-1.622208	0.1064

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.511730	Mean dependent var	14.57776
Adjusted R-squared	0.433815	S.D. dependent var	7.111043
S.E. of regression	5.350722	Akaike info criterion	6.322816
Sum squared resid	5382.483	Schwarz criterion	6.802547
Log likelihood	-661.3483	Hannan-Quinn criter.	6.516565
F-statistic	6.567775	Durbin-Watson stat	1.477962
Prob(F-statistic)	0.000000		

Appendix (23): Estimation results using dual fixed effect model for the second model (ROE)

Dependent Variable: ROE
Method: Panel Least Squares
Date: 02/22/20 Time: 09:24
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
White period standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-553.1768	419.0782	-1.319985	0.1885
DERIVATIVES	-66.11652	61.80371	-1.069782	0.2862
SIZE	-11.73910	7.366450	-1.593590	0.1128
LEVERAGE	618.3259	412.0202	1.500718	0.1352
LIQUIDITY	12.62886	16.05833	0.786437	0.4327
LOAN	4.890223	19.07569	0.256359	0.7980
CREDIT_RISK	-0.141390	0.376641	-0.375397	0.7078

Effects Specification			
Cross-section fixed (dummy variables)			
Period fixed (dummy variables)			

R-squared	0.608162	Mean dependent var	14.57776
Adjusted R-squared	0.522790	S.D. dependent var	7.111043
S.E. of regression	4.912338	Akaike info criterion	6.184988
Sum squared resid	4319.461	Schwarz criterion	6.803996
Log likelihood	-637.2562	Hannan-Quinn criter.	6.434987
F-statistic	7.123630	Durbin-Watson stat	1.701863
Prob(F-statistic)	0.000000		

Appendix (24): Estimation results using random effect model for the second model (ROE)

Dependent Variable: ROE
Method: Panel EGLS (Cross-section random effects)
Date: 02/22/20 Time: 09:24
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
Swamy and Arora estimator of component variances
White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	188.7679	355.9815	0.530275	0.5965
DERIVATIVES	-49.83235	62.34733	-0.799270	0.4250
SIZE	0.873410	1.804093	0.484127	0.6288
LEVERAGE	-180.8332	366.2947	-0.493682	0.6220
LIQUIDITY	26.89440	10.28708	2.614386	0.0096
LOAN	2.103582	12.39954	0.169650	0.8654
CREDIT_RISK	-1.067608	0.306823	-3.479551	0.0006

Effects Specification	S.D.	Rho
Cross-section random	3.596725	0.3112
Idiosyncratic random	5.350722	0.6888

Weighted Statistics			
R-squared	0.096343	Mean dependent var	6.431683
Adjusted R-squared	0.070768	S.D. dependent var	6.002472
S.E. of regression	5.813679	Sum squared resid	7165.358
F-statistic	3.767047	Durbin-Watson stat	1.143016
Prob(F-statistic)	0.001385		

Unweighted Statistics			
R-squared	0.060019	Mean dependent var	14.57776

Appendix (25): Hausman test results for the second model (ROE)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	45.020139	6	0.0000

Appendix (26): Heterosckedasticity test results for the second model (ROE) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ROE

         chi2(1)      =    23.66
         Prob > chi2  =   0.0000
```

Appendix (27): Heterosckedasticity test results for the second model (ROE) using White test

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     30.46
         Prob > chi2  =    0.2941

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	30.46	27	0.2941
Skewness	5.44	6	0.4890
Kurtosis	1.31	1	0.2521
Total	37.21	34	0.3237

Appendix (28): Endogeneity test results for the second model (ROE)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 ROE (Derivatives=Size) Leverage Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                    Obs per group: min =         4
                                                               avg =       8.8
                                                               max =        10

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      219
                                                      F(  5,   189) =     0.24
                                                      Prob > F      =   0.9436
Total (centered) SS     =  7132.056745                Centered R2   = -35.6547
Total (uncentered) SS   =  7132.056745                Uncentered R2 = -35.6547
Residual SS             =   261423.108                Root MSE      =    36.71

------------------------------------------------------------------------------
         ROE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   6809.013   9204.877     0.74   0.459    -11232.21    24850.24
    Leverage |   1890.765   4376.543     0.43   0.666    -6687.101    10468.63
   Liquidity |   -2.41367   77.48835    -0.03   0.975     -154.288    149.4607
        Loan |   9.019733   80.23163     0.11   0.910    -148.2314    166.2708
     CreditR |   4.670754   7.805963     0.60   0.550    -10.62865    19.97016
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           0.577
                                                   Chi-sq(1) P-val =    0.4475
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                0.564
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                              24.048
                                                   Chi-sq(1) P-val =    0.0000
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: Leverage Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------
```

Appendix (29): Estimation results using GMM model for the second model (ROE)

Dependent Variable: ROE
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/01/20 Time: 18:39
Sample (adjusted): 2008 2015
Periods included: 8
Cross-sections included: 25
Total panel (unbalanced) observations: 176
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(ROE,-2) DERIVATIVES SIZE LEVERAGE
LIQUIDITY LOAN CREDIT_RISK

Variable	Coefficient	Std. Error	t-Statistic	Prob.

ROE(-1)	0.228679	0.057020	4.010494	0.0001
DERIVATIVES	-179.7616	49.92227	-3.600831	0.0004
SIZE	-3.782397	2.468652	-1.532171	0.1273
LEVERAGE	-618.1860	518.7830	-1.191608	0.2351
LIQUIDITY	2.859075	7.912648	0.361330	0.7183
LOAN	-22.48360	5.832027	-3.855195	0.0002
CREDIT_RISK	-1.265555	0.238914	-5.297123	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.875284	S.D. dependent var	5.931163
S.E. of regression	6.512383	Sum squared resid	7167.481
J-statistic	22.09929	Instrument rank	25
Prob(J-statistic)	0.227607		

Appendix (30): Arrellano-Bond serial correlation test results for the second model (ROE)

Arellano-Bond Serial Correlation Test
Equation: EQ03
Date: 03/01/20 Time: 18:45
Sample: 2005 2018
Included observations: 176

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.005475	-3466.102524	3447.230544	0.3147
AR(2)	0.86	417.995405		0.3870

Appendix (31): Estimation results using PLS model for the second model (NIM)

Dependent Variable: NIM
Method: Panel Least Squares
Date: 02/22/20 Time: 09:51
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.357694	28.47444	0.328635	0.7428
DERIVATIVES	-7.539893	4.350687	-1.733035	0.0845
SIZE	0.004582	0.103709	0.044185	0.9648
LEVERAGE	-8.853986	28.84663	-0.306933	0.7592
LIQUIDITY	0.315579	0.615203	0.512968	0.6085
LOAN	3.298935	0.431965	7.637049	0.0000
CREDIT_RISK	0.081938	0.022166	3.696516	0.0003

R-squared	0.294307	Mean dependent var	2.875479
Adjusted R-squared	0.274335	S.D. dependent var	0.627890
S.E. of regression	0.534874	Akaike info criterion	1.617872
Sum squared resid	60.65123	Schwarz criterion	1.726199
Log likelihood	-170.1570	Hannan-Quinn criter.	1.661622
F-statistic	14.73565	Durbin-Watson stat	0.315711

Prob(F-statistic)	0.000000		

Appendix (32): Estimation results using fixed effect model for the second model (NIM)

Dependent Variable: NIM
Method: Panel Least Squares
Date: 02/22/20 Time: 10:09
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.31570	29.78838	-0.413440	0.6798
DERIVATIVES	-5.636105	4.936299	-1.141767	0.2550
SIZE	-1.569876	0.259985	-6.038321	0.0000
LEVERAGE	21.77671	30.33421	0.717893	0.4737
LIQUIDITY	-1.868245	0.702335	-2.660047	0.0085
LOAN	1.045662	0.743806	1.405827	0.1614
CREDIT_RISK	0.120613	0.020440	5.900908	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.715869	Mean dependent var	2.875479
Adjusted R-squared	0.670529	S.D. dependent var	0.627890
S.E. of regression	0.360406	Akaike info criterion	0.927306
Sum squared resid	24.41984	Schwarz criterion	1.407038
Log likelihood	-70.54002	Hannan-Quinn criter.	1.121056
F-statistic	15.78887	Durbin-Watson stat	0.750121
Prob(F-statistic)	0.000000		

Appendix (33): Estimation results using dual fixed effect model for the second model (NIM)

Dependent Variable: NIM
Method: Panel Least Squares
Date: 02/22/20 Time: 10:09
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.52841	30.27587	-0.380779	0.7038
DERIVATIVES	-6.730425	5.163745	-1.303400	0.1941
SIZE	-1.682602	0.453608	-3.709377	0.0003
LEVERAGE	21.40247	30.74099	0.696219	0.4872
LIQUIDITY	-1.818243	0.726317	-2.503375	0.0132
LOAN	1.244408	0.798140	1.559135	0.1207
CREDIT_RISK	0.114553	0.022991	4.982608	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.726105	Mean dependent var	2.875479
Adjusted R-squared	0.666429	S.D. dependent var	0.627890

S.E. of regression	0.362642	Akaike info criterion	0.972808
Sum squared resid	23.54011	Schwarz criterion	1.591816
Log likelihood	-66.52247	Hannan-Quinn criter.	1.222807
F-statistic	12.16754	Durbin-Watson stat	0.717242
Prob(F-statistic)	0.000000		

Appendix (34): Estimation results using random effect model for the second model (NIM)

Dependent Variable: NIM
Method: Panel EGLS (Cross-section random effects)
Date: 02/22/20 Time: 10:09
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.291200	27.51452	0.228650	0.8194
DERIVATIVES	-2.570874	4.560425	-0.563736	0.5735
SIZE	-0.333997	0.141726	-2.356637	0.0194
LEVERAGE	-3.139870	27.93204	-0.112411	0.9106
LIQUIDITY	-0.326434	0.616911	-0.529142	0.5973
LOAN	1.590379	0.594151	2.676724	0.0080
CREDIT_RISK	0.097037	0.019225	5.047469	0.0000

Effects Specification

	S.D.	Rho
Cross-section random	0.400944	0.5531
Idiosyncratic random	0.360406	0.4469

Weighted Statistics

R-squared	0.164093	Mean dependent var	0.827483
Adjusted R-squared	0.140435	S.D. dependent var	0.428136
S.E. of regression	0.386602	Sum squared resid	31.68572
F-statistic	6.936123	Durbin-Watson stat	0.532858
Prob(F-statistic)	0.000001		

Unweighted Statistics

R-squared	0.133125	Mean dependent var	2.875479
Sum squared resid	74.50412	Durbin-Watson stat	0.226618

Appendix (35): Hausman test results for the second model (NIM)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	39.707072	6	0.0000

Appendix (36): Heterosckedasticity test results for the second model (NIM) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of NIM

         chi2(1)      =     3.18
         Prob > chi2  =   0.0747

.
```

Appendix (37): Heterosckedasticity test results for the second model (NIM) using White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     38.43
         Prob > chi2  =    0.0713

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	38.43	27	0.0713
Skewness	12.76	6	0.0470
Kurtosis	0.97	1	0.3247
Total	52.16	34	0.0240

Appendix (38): Endogeneity test results for the second model (NIM)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 NIM (Derivatives=Size) Leverage Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =       25                Obs per group: min =         4
                                                          avg =       8.8
                                                          max =        10

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      219
                                                      F(  5,   189) =     0.21
                                                      Prob > F      =   0.9592
Total (centered) SS     =    33.443095                Centered R2   = -47.3382
Total (uncentered) SS   =    33.443095                Uncentered R2 = -47.3382
Residual SS             =  1616.580048                Root MSE      =    2.887

------------------------------------------------------------------------------
         NIM |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   540.8793   723.8434     0.75   0.455    -877.8277    1959.586
    Leverage |   141.5615   344.1579     0.41   0.681    -532.9756    816.0987
   Liquidity |  -2.676903   6.093447    -0.44   0.660    -14.61984    9.266033
        Loan |   2.250784    6.30917     0.36   0.721    -10.11496    14.61653
     CreditR |     .53618    .613837     0.87   0.382    -.6669185    1.739279
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           0.577
                                                   Chi-sq(1) P-val =    0.4475
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                0.564
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                              31.513
                                                   Chi-sq(1) P-val =    0.0000
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: Leverage Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------
```

Appendix (39): Estimation results using PLS model for the second model (CIR)

Dependent Variable: CIR
Method: Panel Least Squares
Date: 02/22/20 Time: 10:13
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1146.728	408.8285	2.804911	0.0055
DERIVATIVES	153.2091	62.46601	2.452679	0.0150
SIZE	-5.834662	1.489027	-3.918438	0.0001

LEVERAGE	-1061.842	414.1722	-2.563770	0.0110
LIQUIDITY	-30.45060	8.832923	-3.447398	0.0007
LOAN	-35.88327	6.202034	-5.785727	0.0000
CREDIT_RISK	1.041492	0.318256	3.272503	0.0012

R-squared	0.415878	Mean dependent var	35.74447
Adjusted R-squared	0.399347	S.D. dependent var	9.908909
S.E. of regression	7.679585	Akaike info criterion	6.946450
Sum squared resid	12502.92	Schwarz criterion	7.054776
Log likelihood	-753.6362	Hannan-Quinn criter.	6.990199
F-statistic	25.15636	Durbin-Watson stat	0.395006
Prob(F-statistic)	0.000000		

Appendix (40): Estimation results using fixed effect model for the second model (CIR)

Dependent Variable: CIR
Method: Panel Least Squares
Date: 02/22/20 Time: 10:27
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-610.6983	325.6085	-1.875560	0.0623
DERIVATIVES	140.2282	53.95732	2.598873	0.0101
SIZE	8.537169	2.841830	3.004110	0.0030
LEVERAGE	607.2110	331.5748	1.831294	0.0686
LIQUIDITY	-1.918452	7.677030	-0.249895	0.8029
LOAN	-1.355599	8.130337	-0.166733	0.8678
CREDIT_RISK	0.226654	0.223421	1.014469	0.3117

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.863689	Mean dependent var	35.74447
Adjusted R-squared	0.841937	S.D. dependent var	9.908909
S.E. of regression	3.939502	Akaike info criterion	5.710461
Sum squared resid	2917.699	Schwarz criterion	6.190193
Log likelihood	-594.2955	Hannan-Quinn criter.	5.904211
F-statistic	39.70648	Durbin-Watson stat	1.339280
Prob(F-statistic)	0.000000		

Appendix (41): Estimation results using dual fixed effect model for the second model (CIR)

Dependent Variable: CIR
Method: Panel Least Squares
Date: 02/22/20 Time: 10:28
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-649.7483	332.3376	-1.955085	0.0521
DERIVATIVES	163.5325	56.68232	2.885071	0.0044

SIZE	11.72448	4.979241	2.354671	0.0196
LEVERAGE	629.8543	337.4432	1.866549	0.0636
LIQUIDITY	0.276813	7.972763	0.034720	0.9723
LOAN	0.862780	8.761171	0.098478	0.9217
CREDIT_RISK	0.159689	0.252367	0.632764	0.5277

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.867485	Mean dependent var	35.74447
Adjusted R-squared	0.838613	S.D. dependent var	9.908909
S.E. of regression	3.980710	Akaike info criterion	5.764408
Sum squared resid	2836.444	Schwarz criterion	6.383417
Log likelihood	-591.2027	Hannan-Quinn criter.	6.014408
F-statistic	30.04583	Durbin-Watson stat	1.327611
Prob(F-statistic)	0.000000		

Appendix (42): Estimation results using random effect model for the second model (CIR)

Dependent Variable: CIR
Method: Panel EGLS (Cross-section random effects)
Date: 02/22/20 Time: 10:28
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-502.4698	310.5341	-1.618082	0.1071
DERIVATIVES	101.5876	51.39503	1.976604	0.0494
SIZE	-5.447840	1.800999	-3.024899	0.0028
LEVERAGE	568.6022	315.4452	1.802539	0.0729
LIQUIDITY	-19.98244	7.040014	-2.838409	0.0050
LOAN	-4.012432	7.058467	-0.568457	0.5703
CREDIT_RISK	0.488552	0.214446	2.278206	0.0237

Effects Specification

	S.D.	Rho
Cross-section random	6.000428	0.6988
Idiosyncratic random	3.939502	0.3012

Weighted Statistics

R-squared	0.063885	Mean dependent var	7.770934
Adjusted R-squared	0.037391	S.D. dependent var	4.897570
S.E. of regression	4.489506	Sum squared resid	4273.001
F-statistic	2.411298	Durbin-Watson stat	0.926589
Prob(F-statistic)	0.028256		

Unweighted Statistics

R-squared	0.193456	Mean dependent var	35.74447
Sum squared resid	17263.79	Durbin-Watson stat	0.229342

Appendix (43): Hausman test results for the second model (CIR)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	69.471156	6	0.0000

Appendix (44): Heterosckedasticity test results for the second model (CIR) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of CIR

         chi2(1)      =    93.18
         Prob > chi2  =   0.0000
```

Appendix (45): Heterosckedasticity test results for the second model (CIR) using White test

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =    135.71
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	135.71	27	0.0000
Skewness	41.47	6	0.0000
Kurtosis	3.00	1	0.0831
Total	180.18	34	0.0000

Appendix (46): Endogeneity test results for the second model (CIR)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 CIR (Derivatives=Size) Leverage Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =       25                 Obs per group: min =         4
                                                           avg =       8.8
                                                           max =        10

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      219
                                                      F(  5,   189) =     0.31
                                                      Prob > F      =   0.9055
Total (centered) SS     =  3434.843059                Centered R2   = -13.5575
Total (uncentered) SS   =  3434.843059                Uncentered R2 = -13.5575
Residual SS             =  50002.85174                Root MSE      =    16.05

------------------------------------------------------------------------------
         CIR |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |  -2831.787   4025.718    -0.70   0.482    -10722.05    5058.477
    Leverage |  -44.19287   1914.064    -0.02   0.982     -3795.69    3707.305
   Liquidity |   2.479127   33.88924     0.07   0.942    -63.94256    68.90081
        Loan |   -7.90919     35.089    -0.23   0.822    -76.68237    60.86399
     CreditR |  -2.033247   3.413908    -0.60   0.551    -8.724385     4.65789
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           0.577
                                                   Chi-sq(1) P-val =    0.4475
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                0.564
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                               8.886
                                                   Chi-sq(1) P-val =    0.0029
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: Leverage Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------
```

Appendix (47): Estimation results using PLS model for the third model (Total risk)

Dependent Variable: TOTAL_RISK
Method: Panel Least Squares
Date: 03/04/20 Time: 17:32
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.206246	0.880338	0.234280	0.8151
DERIVATIVES	6.902450	10.53486	0.655201	0.5135

SIZE	0.206695	0.125471	1.647357	0.1018
NIM	-0.592946	0.180468	-3.285599	0.0013
LIQUIDITY	6.977961	1.417970	4.921091	0.0000
LOAN	-0.730243	1.073372	-0.680327	0.4975
CREDIT_RISK	0.131669	0.046885	2.808315	0.0057

R-squared	0.312815	Mean dependent var	0.592704
Adjusted R-squared	0.282273	S.D. dependent var	1.010072
S.E. of regression	0.855721	Akaike info criterion	2.574294
Sum squared resid	98.85481	Schwarz criterion	2.720004
Log likelihood	-175.7749	Hannan-Quinn criter.	2.633504
F-statistic	10.24226	Durbin-Watson stat	0.860165
Prob(F-statistic)	0.000000		

Appendix (48): Estimation results using fixed effect model for the third model (Total risk)

Dependent Variable: TOTAL_RISK
Method: Panel Least Squares
Date: 03/04/20 Time: 17:44
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.37774	3.852860	4.250800	0.0000
DERIVATIVES	-24.10013	13.64859	-1.765759	0.0802
SIZE	-2.547962	0.742420	-3.431967	0.0008
NIM	-0.894622	0.206456	-4.333232	0.0000
LIQUIDITY	-1.827259	1.817752	-1.005230	0.3170
LOAN	-1.987071	1.795644	-1.106607	0.2709
CREDIT_RISK	0.085943	0.056212	1.528902	0.1291

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.782439	Mean dependent var	0.592704
Adjusted R-squared	0.723638	S.D. dependent var	1.010072
S.E. of regression	0.530996	Akaike info criterion	1.762199
Sum squared resid	31.29721	Schwarz criterion	2.407485
Log likelihood	-94.11611	Hannan-Quinn criter.	2.024417
F-statistic	13.30670	Durbin-Watson stat	2.150459
Prob(F-statistic)	0.000000		

Appendix (49): Estimation results using dual fixed effect model for the third model (Total risk)

Dependent Variable: TOTAL_RISK
Method: Panel Least Squares
Date: 03/04/20 Time: 17:50
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.250651	5.785589	1.080383	0.2824
DERIVATIVES	-31.64390	14.09816	-2.244541	0.0269
SIZE	-0.392786	1.178479	-0.333300	0.7396
NIM	-0.778592	0.208618	-3.732140	0.0003
LIQUIDITY	-3.375560	1.903678	-1.773178	0.0791
LOAN	-1.851583	1.782238	-1.038909	0.3012
CREDIT_RISK	0.087206	0.055841	1.561673	0.1213

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.797473	Mean dependent var	0.592704
Adjusted R-squared	0.730601	S.D. dependent var	1.010072
S.E. of regression	0.524265	Akaike info criterion	1.761014
Sum squared resid	29.13446	Schwarz criterion	2.510379
Log likelihood	-89.03200	Hannan-Quinn criter.	2.065525
F-statistic	11.92534	Durbin-Watson stat	2.212072
Prob(F-statistic)	0.000000		

Appendix (50): Estimation results using random effect model for the third model (Total risk)

Dependent Variable: TOTAL_RISK
Method: Panel EGLS (Cross-section random effects)
Date: 03/04/20 Time: 18:10
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.856658	1.420843	2.010538	0.0464
DERIVATIVES	-7.089276	11.62954	-0.609592	0.5432
SIZE	-0.063774	0.209039	-0.305080	0.7608
NIM	-0.529052	0.162374	-3.258224	0.0014
LIQUIDITY	1.695853	1.519853	1.115801	0.2665
LOAN	-1.612278	1.260951	-1.278621	0.2032
CREDIT_RISK	0.097636	0.049848	1.958682	0.0522

Effects Specification

	S.D.	Rho
Cross-section random	0.684342	0.6242
Idiosyncratic random	0.530996	0.3758

Weighted Statistics

R-squared	0.119003	Mean dependent var	0.180980
Adjusted R-squared	0.079847	S.D. dependent var	0.585530
S.E. of regression	0.562290	Sum squared resid	42.68301
F-statistic	3.039243	Durbin-Watson stat	1.655208
Prob(F-statistic)	0.008066		

Unweighted Statistics

R-squared	0.194479	Mean dependent var	0.592704
Sum squared resid	115.8780	Durbin-Watson stat	0.609686

Appendix (51): Hausman test results for the third model (Total risk)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	23.056018	6	0.0008

Appendix (52): Heterosckedasticity test results for the third model (Total risk) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of TotalR

         chi2(1)      =   189.71
         Prob > chi2  =   0.0000
```

Appendix (53): Heterosckedasticity test results for the third model (Total risk) using White test

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     80.79
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	80.79	27	0.0000
Skewness	21.54	6	0.0015
Kurtosis	1.67	1	0.1959
Total	104.00	34	0.0000

Appendix (54): Endogeneity test results for the third model (Total risk)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 TotalR (Derivatives=Size) NIM Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                Obs per group: min =         4
                                                           avg =       5.7
                                                           max =         6

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      142
                                                      F(  5,    112) =     0.88
                                                      Prob > F      =   0.4954
Total (centered) SS     =  38.81031036                Centered R2   =  -3.3388
Total (uncentered) SS   =  38.81031036                Uncentered R2 =  -3.3388
Residual SS             =  168.3904145                Root MSE      =      1.2

------------------------------------------------------------------------------
      TotalR |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   276.8569    195.709     1.41   0.157    -106.7256    660.4394
         NIM |  -.4879504   .4060939    -1.20   0.230     -1.28388    .3079789
   Liquidity |  -4.644262   4.916427    -0.94   0.345    -14.28028    4.991757
        Loan |  -2.779749   3.985994    -0.70   0.486    -10.59215    5.032657
     CreditR |   .1508486   .1358627     1.11   0.267    -.1154374    .4171346
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):          2.834
                                                   Chi-sq(1) P-val =    0.0923
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):               2.780
Stock-Yogo weak ID test critical values: 10% maximal IV size            16.38
                                         15% maximal IV size             8.96
                                         20% maximal IV size             6.66
                                         25% maximal IV size             5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):          0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                             11.224
                                                   Chi-sq(1) P-val =    0.0008
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: NIM Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------

.
```

Appendix (55): Estimation results using GMM model for the third model (Total risk)

Dependent Variable: TOTAL_RISK
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/04/20 Time: 18:40
Sample (adjusted): 2012 2015
Periods included: 4
Cross-sections included: 25
Total panel (unbalanced) observations: 98
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(TOTAL_RISK,-2) DERIVATIVES SIZE NIM LIQUIDITY LOAN CREDIT_RISK

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TOTAL_RISK(-1)	-0.029499	0.015024	-1.963518	0.0526
DERIVATIVES	-14.79577	5.704217	-2.593830	0.0111
SIZE	-3.665422	0.433798	-8.449608	0.0000
NIM	-0.773606	0.072399	-10.68536	0.0000
LIQUIDITY	-0.807189	0.697533	-1.157206	0.2502
LOAN	-0.353676	0.888523	-0.398049	0.6915
CREDIT_RISK	0.085216	0.040953	2.080827	0.0403

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.028690	S.D. dependent var	0.661378
S.E. of regression	0.664498	Sum squared resid	40.18178
J-statistic	17.28021	Instrument rank	16
Prob(J-statistic)	0.044505		

Appendix (56): Arrellano-Bond serial correlation test results for the third model (Total risk)

Arellano-Bond Serial Correlation Test
Equation: EQ01
Date: 03/04/20 Time: 18:47
Sample: 2005 2018
Included observations: 98

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.470675	-15.835319	10.767385	0.1414
AR(2)	-1.313132	-3.094134	2.356301	0.1891

Appendix (57): Estimation results using PLS model for the third model (Systematic risk)

Dependent Variable: SYSTEMATIC_RISK
Method: Panel Least Squares
Date: 03/05/20 Time: 17:10
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.124784	0.431242	-0.289359	0.7728
DERIVATIVES	4.847466	5.160607	0.939321	0.3492
SIZE	0.112162	0.061463	1.824873	0.0702
NIM	-0.271643	0.088404	-3.072744	0.0026
LIQUIDITY	2.657694	0.694607	3.826184	0.0002
LOAN	0.073409	0.525802	0.139613	0.8892
CREDIT_RISK	0.051000	0.022967	2.220537	0.0280

R-squared	0.219021	Mean dependent var	0.285521
Adjusted R-squared	0.184311	S.D. dependent var	0.464132

S.E. of regression	0.419183	Akaike info criterion	1.147023
Sum squared resid	23.72149	Schwarz criterion	1.292733
Log likelihood	-74.43862	Hannan-Quinn criter.	1.206233
F-statistic	6.310003	Durbin-Watson stat	1.788268
Prob(F-statistic)	0.000007		

Appendix (58): Estimation results using fixed effect model for the third model (Systematic risk)

Dependent Variable: SYSTEMATIC_RISK
Method: Panel Least Squares
Date: 03/05/20 Time: 17:17
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.414422	2.480009	1.376778	0.1714
DERIVATIVES	-7.095663	8.785327	-0.807672	0.4210
SIZE	-0.587221	0.477881	-1.228801	0.2217
NIM	-0.239507	0.132892	-1.802271	0.0742
LIQUIDITY	0.225530	1.170051	0.192752	0.8475
LOAN	0.386573	1.155820	0.334458	0.7387
CREDIT_RISK	0.012580	0.036183	0.347694	0.7287

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.573083	Mean dependent var	0.285521
Adjusted R-squared	0.457700	S.D. dependent var	0.464132
S.E. of regression	0.341792	Akaike info criterion	0.881092
Sum squared resid	12.96719	Schwarz criterion	1.526378
Log likelihood	-31.55752	Hannan-Quinn criter.	1.143310
F-statistic	4.966796	Durbin-Watson stat	3.178179
Prob(F-statistic)	0.000000		

Appendix (59): Estimation results using dual fixed effect model for the third model (Systematic risk)

Dependent Variable: SYSTEMATIC_RISK
Method: Panel Least Squares
Date: 03/05/20 Time: 17:24
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.098420	3.775833	0.290908	0.7717
DERIVATIVES	-10.29386	9.200843	-1.118795	0.2658
SIZE	-0.085137	0.769107	-0.110696	0.9121
NIM	-0.205531	0.136150	-1.509592	0.1341
LIQUIDITY	-0.202158	1.242392	-0.162716	0.8711
LOAN	0.355865	1.163137	0.305953	0.7602

CREDIT_RISK	0.011603	0.036444	0.318377	0.7508

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.591460	Mean dependent var	0.285521
Adjusted R-squared	0.456565	S.D. dependent var	0.464132
S.E. of regression	0.342149	Akaike info criterion	0.907516
Sum squared resid	12.40902	Schwarz criterion	1.656880
Log likelihood	-28.43362	Hannan-Quinn criter.	1.212027
F-statistic	4.384583	Durbin-Watson stat	3.181193
Prob(F-statistic)	0.000000		

Appendix (60): Estimation results using random effect model for the third model (Systematic risk)

Dependent Variable: SYSTEMATIC_RISK
Method: Panel EGLS (Cross-section random effects)
Date: 03/05/20 Time: 17:30
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.149107	0.650594	0.229186	0.8191
DERIVATIVES	1.453513	6.473152	0.224545	0.8227
SIZE	0.074280	0.092191	0.805716	0.4218
NIM	-0.211585	0.094970	-2.227921	0.0275
LIQUIDITY	1.521698	0.849035	1.792269	0.0753
LOAN	0.055425	0.654884	0.084633	0.9327
CREDIT_RISK	0.032875	0.028073	1.171054	0.2436

Effects Specification

	S.D.	Rho
Cross-section random	0.257513	0.3621
Idiosyncratic random	0.341792	0.6379

Weighted Statistics

R-squared	0.070998	Mean dependent var	0.137296
Adjusted R-squared	0.029709	S.D. dependent var	0.349806
S.E. of regression	0.345076	Sum squared resid	16.07547
F-statistic	1.719539	Durbin-Watson stat	2.572736
Prob(F-statistic)	0.121009		

Unweighted Statistics

R-squared	0.185445	Mean dependent var	0.285521
Sum squared resid	24.74135	Durbin-Watson stat	1.671612

Appendix (61): Hausman test results for the third model (Systematic risk)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	9.136501	6	0.1660

Appendix (62): Heterosckedasticity test results for the third model (Systematic risk) using Breusch-Pagan test

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of SystematicR

         chi2(1)      =   230.84
         Prob > chi2  =   0.0000
```

Appendix (63): Heterosckedasticity test results for the third model (Systematic risk) using White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     41.91
         Prob > chi2  =    0.0336

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	41.91	27	0.0336
Skewness	15.62	6	0.0159
Kurtosis	1.91	1	0.1674
Total	59.44	34	0.0044

Appendix (64): Endogeneity test results for the third model (Systematic risk)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 SystematicR (Derivatives=Size) NIM Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                    Obs per group: min =         4
                                                               avg =       5.7
                                                               max =         6

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      142
                                                      F(  5,    112) =    0.42
                                                      Prob > F      =   0.8315
Total (centered) SS     =  13.42618679                Centered R2   =  -0.5082
Total (uncentered) SS   =  13.42618679                Uncentered R2 =  -0.5082
Residual SS             =   20.2488902                Root MSE      =     .416

------------------------------------------------------------------------------
 SystematicR |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   62.26496   67.86607     0.92   0.359    -70.75008      195.28
         NIM |  -.1457824   .1408213    -1.04   0.301    -.4217871    .1302223
   Liquidity |  -.4236963   1.704871    -0.25   0.804    -3.765182    2.917789
        Loan |   .2038871   1.382225     0.15   0.883    -2.505223    2.912998
     CreditR |   .0275391   .0471132     0.58   0.559     -.064801    .1198792
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           2.834
                                                   Chi-sq(1) P-val =    0.0923
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                2.780
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                               1.570
                                                   Chi-sq(1) P-val =    0.2102
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: NIM Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------

.
```

Appendix (65): Estimation results using GMM model for the third model (Systematic risk)

Dependent Variable: SYSTEMATIC_RISK
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/05/20   Time: 17:48
Sample (adjusted): 2012 2015
Periods included: 4
Cross-sections included: 25
Total panel (unbalanced) observations: 98
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(SYSTEMATIC_RISK,-2) DERIVATIVES SIZE NIM LIQUIDITY LOAN CREDIT_RISK

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SYSTEMATIC_RISK(-1)	-0.399542	0.011918	-33.52403	0.0000
DERIVATIVES	-6.256027	3.129675	-1.998938	0.0486
SIZE	-0.885585	0.302201	-2.930452	0.0043
NIM	-0.033368	0.059744	-0.558510	0.5779
LIQUIDITY	0.890832	0.495810	1.796723	0.0757
LOAN	1.756281	0.374337	4.691717	0.0000
CREDIT_RISK	-0.026057	0.008979	-2.902011	0.0047

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	0.005180	S.D. dependent var	0.508102
S.E. of regression	0.390149	Sum squared resid	13.85168
J-statistic	11.72629	Instrument rank	16
Prob(J-statistic)	0.229184		

Appendix (66): Arrellano-Bond serial correlation test results for the third model (Systematic risk)

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 03/05/20 Time: 17:54
Sample: 2005 2018
Included observations: 98

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.727317	-3.262561	1.888803	0.0841
AR(2)	-1.196989	-4.083603	3.411563	0.2313

Appendix (67): Estimation results using PLS model for the third model (Specific risk)

Dependent Variable: SPECIFIC_RISK
Method: Panel Least Squares
Date: 03/06/20 Time: 17:34
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.313651	0.801898	0.391136	0.6963
DERIVATIVES	4.375031	9.596179	0.455914	0.6492
SIZE	0.165365	0.114291	1.446879	0.1502
NIM	-0.502267	0.164388	-3.055374	0.0027
LIQUIDITY	6.163225	1.291626	4.771680	0.0000
LOAN	-0.879363	0.977732	-0.899391	0.3700
CREDIT_RISK	0.119112	0.042708	2.788990	0.0061

R-squared	0.305155	Mean dependent var	0.487468
Adjusted R-squared	0.274273	S.D. dependent var	0.914987
S.E. of regression	0.779474	Akaike info criterion	2.387644
Sum squared resid	82.02325	Schwarz criterion	2.533354
Log likelihood	-162.5227	Hannan-Quinn criter.	2.446855
F-statistic	9.881335	Durbin-Watson stat	0.996328
Prob(F-statistic)	0.000000		

Appendix (68): Estimation results using fixed effect model for the third model (Specific risk)

Dependent Variable: SPECIFIC_RISK
Method: Panel Least Squares
Date: 03/06/20 Time: 17:41
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.59354	3.650490	4.545565	0.0000
DERIVATIVES	-22.20591	12.93170	-1.717168	0.0887
SIZE	-2.487424	0.703425	-3.536162	0.0006
NIM	-0.895221	0.195612	-4.576512	0.0000
LIQUIDITY	-2.513084	1.722276	-1.459165	0.1473
LOAN	-2.827752	1.701328	-1.662085	0.0993
CREDIT_RISK	0.095104	0.053260	1.785659	0.0769

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.761992	Mean dependent var	0.487468
Adjusted R-squared	0.697665	S.D. dependent var	0.914987
S.E. of regression	0.503106	Akaike info criterion	1.654290
Sum squared resid	28.09580	Schwarz criterion	2.299576
Log likelihood	-86.45459	Hannan-Quinn criter.	1.916508
F-statistic	11.84567	Durbin-Watson stat	2.285382
Prob(F-statistic)	0.000000		

Appendix (69): Estimation results using dual fixed effect model for the third model (Specific risk)

Dependent Variable: SPECIFIC_RISK
Method: Panel Least Squares
Date: 03/06/20 Time: 17:46
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.864658	5.463938	1.256357	0.2117
DERIVATIVES	-28.50589	13.31437	-2.140987	0.0346
SIZE	-0.420934	1.112961	-0.378211	0.7060

NIM	-0.786096	0.197020	-3.989931	0.0001
LIQUIDITY	-3.999995	1.797842	-2.224886	0.0282
LOAN	-2.674570	1.683154	-1.589023	0.1150
CREDIT_RISK	0.097628	0.052737	1.851229	0.0669

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.779873	Mean dependent var	0.487468
Adjusted R-squared	0.707189	S.D. dependent var	0.914987
S.E. of regression	0.495118	Akaike info criterion	1.646613
Sum squared resid	25.98504	Schwarz criterion	2.395978
Log likelihood	-80.90954	Hannan-Quinn criter.	1.951125
F-statistic	10.72969	Durbin-Watson stat	2.348375
Prob(F-statistic)	0.000000		

Appendix (70): Estimation results using random effect model for the third model (Specific risk)

Dependent Variable: SPECIFIC_RISK
Method: Panel EGLS (Cross-section random effects)
Date: 03/06/20 Time: 17:50
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.878592	1.278627	2.251315	0.0260
DERIVATIVES	-6.631744	10.82493	-0.612636	0.5411
SIZE	-0.073162	0.186450	-0.392392	0.6954
NIM	-0.500133	0.151846	-3.293692	0.0013
LIQUIDITY	1.381166	1.414076	0.976727	0.3305
LOAN	-1.823456	1.158176	-1.574420	0.1177
CREDIT_RISK	0.102420	0.046474	2.203814	0.0292

Effects Specification

	S.D.	Rho
Cross-section random	0.598099	0.5856
Idiosyncratic random	0.503106	0.4144

Weighted Statistics

R-squared	0.130912	Mean dependent var	0.160015
Adjusted R-squared	0.092286	S.D. dependent var	0.562353
S.E. of regression	0.536284	Sum squared resid	38.82600
F-statistic	3.389204	Durbin-Watson stat	1.774827
Prob(F-statistic)	0.003811		

Unweighted Statistics

R-squared	0.194134	Mean dependent var	0.487468
Sum squared resid	95.12879	Durbin-Watson stat	0.724380

Appendix (71): Hausman test results for the third model (Specific risk)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	25.066923	6	0.0003

Appendix (72): Heterosckedasticity test results for the third model (Specific risk) using Breusch-Pagan test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of SpecificR

         chi2(1)      =   189.81
         Prob > chi2  =   0.0000
```

Appendix (73): Heterosckedasticity test results for the third model (Specific risk) using White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     78.99
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	78.99	27	0.0000
Skewness	21.67	6	0.0014
Kurtosis	1.82	1	0.1774
Total	102.47	34	0.0000

Appendix (74): Endogeneity test results for the third model (Specific risk)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 SpecificR (Derivatives=Size) NIM Liquidity Loan CreditR , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                  Obs per group: min =         4
                                                             avg =       5.7
                                                             max =         6

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      142
                                                      F(  5,   112) =     1.01
                                                      Prob > F      =   0.4180
Total (centered) SS     =  35.96758724                Centered R2   =  -3.4137
Total (uncentered) SS   =  35.96758724                Uncentered R2 =  -3.4137
Residual SS             =  158.7519353                Root MSE      =    1.165

------------------------------------------------------------------------------
   SpecificR |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   271.6006   190.0254     1.43   0.153    -100.8423    644.0435
         NIM |  -.4982115   .3943004    -1.26   0.206    -1.271026    .2746032
   Liquidity |  -5.263158   4.773648    -1.10   0.270    -14.61934     4.09302
        Loan |  -3.601596   3.870237    -0.93   0.352    -11.18712    3.983928
     CreditR |   .1584672   .1319171     1.20   0.230    -.1000856      .41702
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           2.834
                                                   Chi-sq(1) P-val =    0.0923
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                2.780
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                              11.846
                                                   Chi-sq(1) P-val =    0.0006
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: NIM Liquidity Loan CreditR
Excluded instruments: Size
------------------------------------------------------------------------------

.
```

Appendix (75): Estimation results using GMM model for the third model (Specific risk)

Dependent Variable: SPECIFIC_RISK
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/06/20   Time: 18:10
Sample (adjusted): 2012 2015
Periods included: 4
Cross-sections included: 25
Total panel (unbalanced) observations: 98
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(SPECIFIC_RISK,-2) DERIVATIVES SIZE

NIM LIQUIDITY LOAN CREDIT_RISK

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPECIFIC_RISK(-1)	-0.118995	0.010782	-11.03646	0.0000
DERIVATIVES	-24.21771	6.099441	-3.970480	0.0001
SIZE	-4.150148	0.472664	-8.780329	0.0000
NIM	-1.143527	0.090933	-12.57543	0.0000
LIQUIDITY	-1.709826	0.675960	-2.529480	0.0131
LOAN	-1.376463	0.710207	-1.938117	0.0557
CREDIT_RISK	0.096265	0.038025	2.531653	0.0131

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.031118	S.D. dependent var	0.694468
S.E. of regression	0.662161	Sum squared resid	39.89956
J-statistic	18.94256	Instrument rank	16
Prob(J-statistic)	0.256861		

Appendix (76): Arrellano-Bond serial correlation test results for the third model (Specific risk)

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 03/06/20 Time: 18:14
Sample: 2005 2018
Included observations: 98

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.271366	-21.205695	16.679457	0.2036
AR(2)	0.832375	6.845401	8.223937	0.4052

Appendix (77): Estimation results using PLS model for the fourth model (Leverage risk)

Dependent Variable: LEVERAGE
Method: Panel Least Squares
Date: 03/07/20 Time: 10:02
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.987288	0.000766	1288.394	0.0000
DERIVATIVES	-0.014669	0.010442	-1.404730	0.1615
SIZE	0.002671	0.000139	19.25963	0.0000
NIM	-0.000227	0.000141	-1.610569	0.1087

R-squared	0.659040	Mean dependent var	0.998866
Adjusted R-squared	0.654282	S.D. dependent var	0.002192
S.E. of regression	0.001289	Akaike info criterion	-10.45160
Sum squared resid	0.000357	Schwarz criterion	-10.38970
Log likelihood	1148.450	Hannan-Quinn criter.	-10.42660
F-statistic	138.5239	Durbin-Watson stat	0.184572

Prob(F-statistic)	0.000000

Appendix (78): Estimation results using fixed effect model for the fourth model (Leverage risk)

Dependent Variable: LEVERAGE
Method: Panel Least Squares
Date: 03/07/20 Time: 10:05
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.983798	0.002531	388.6391	0.0000
DERIVATIVES	0.000591	0.012101	0.048850	0.9611
SIZE	0.003337	0.000509	6.552923	0.0000
NIM	-0.000118	0.000161	-0.733492	0.4642

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.855974	Mean dependent var	0.998866
Adjusted R-squared	0.835615	S.D. dependent var	0.002192
S.E. of regression	0.000889	Akaike info criterion	-11.09419
Sum squared resid	0.000151	Schwarz criterion	-10.66089
Log likelihood	1242.814	Hannan-Quinn criter.	-10.91919
F-statistic	42.04271	Durbin-Watson stat	0.417219
Prob(F-statistic)	0.000000		

Appendix (79): Estimation results using dual fixed effect model for the fourth model (Leverage risk)

Dependent Variable: LEVERAGE
Method: Panel Least Squares
Date: 03/07/20 Time: 10:08
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.982305	0.005255	186.9347	0.0000
DERIVATIVES	-0.002945	0.012874	-0.228794	0.8193
SIZE	0.003644	0.001104	3.301401	0.0012
NIM	-8.32E-05	0.000170	-0.488258	0.6260

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.857746	Mean dependent var	0.998866

Adjusted R-squared	0.829607	S.D. dependent var	0.002192
S.E. of regression	0.000905	Akaike info criterion	-11.02438
Sum squared resid	0.000149	Schwarz criterion	-10.45179
Log likelihood	1244.169	Hannan-Quinn criter.	-10.79313
F-statistic	30.48330	Durbin-Watson stat	0.439551
Prob(F-statistic)	0.000000		

Appendix (80): Estimation results using random effect model for the fourth model (Leverage risk)

Dependent Variable: LEVERAGE
Method: Panel EGLS (Cross-section random effects)
Date: 03/07/20 Time: 10:12
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.985236	0.001333	739.0580	0.0000
DERIVATIVES	-0.004005	0.011091	-0.361128	0.7184
SIZE	0.003044	0.000260	11.68669	0.0000
NIM	-0.000166	0.000147	-1.126316	0.2613

Effects Specification

	S.D.	Rho
Cross-section random	0.001012	0.5647
Idiosyncratic random	0.000889	0.4353

Weighted Statistics

R-squared	0.400224	Mean dependent var	0.281295
Adjusted R-squared	0.391855	S.D. dependent var	0.032186
S.E. of regression	0.000896	Sum squared resid	0.000173
F-statistic	47.82244	Durbin-Watson stat	0.369320
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.639137	Mean dependent var	0.998866
Sum squared resid	0.000378	Durbin-Watson stat	0.168633

Appendix (81): Hausman test results for the fourth model (Leverage risk)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	1.090688	3	0.7793

Appendix (82): Heterosckedasticity test results for the fourth model (Leverage risk) using Breusch-Pagan test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Leverage

         chi2(1)      =   224.97
         Prob > chi2  =   0.0000
```

Appendix (83): Heterosckedasticity test results for the fourth model (Leverage risk) using White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(9)      =     63.03
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	63.03	9	0.0000
Skewness	15.61	3	0.0014
Kurtosis	1.52	1	0.2181
Total	80.16	13	0.0000

Appendix (84): Endogeneity test results for the fourth model (Leverage risk)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 Leverage (Derivatives=Size) NIM , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                    Obs per group: min =         4
                                                               avg =       8.8
                                                               max =        10

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      219
                                                      F(  2,   192) =     2.81
                                                      Prob > F      =   0.0629
Total (centered) SS     =   .000190632                Centered R2   =  -6.1222
Total (uncentered) SS   =   .000190632                Uncentered R2 =  -6.1222
Residual SS             =  .0013577182                Root MSE      =  .002645

------------------------------------------------------------------------------
    Leverage |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |  -.4723024   .2117243    -2.23   0.026    -.8872744   -.0573304
         NIM |  -.0010486   .0005465    -1.92   0.055    -.0021196    .0000224
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           5.455
                                                   Chi-sq(1) P-val =    0.0195
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                5.555
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                              35.610
                                                   Chi-sq(1) P-val =    0.0000
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: NIM
Excluded instruments: Size
------------------------------------------------------------------------------

.
```

Appendix (85): Estimation results using GMM model for the fourth model (Leverage risk)

Dependent Variable: LEVERAGE
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/07/20 Time: 10:27
Sample (adjusted): 2008 2015
Periods included: 8
Cross-sections included: 25
Total panel (unbalanced) observations: 168
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(LEVERAGE,-2) DERIVATIVES SIZE NIM

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LEVERAGE(-1)	0.119553	0.005262	22.72217	0.0000
DERIVATIVES	6.11E-06	0.000184	0.033230	0.9735
SIZE	0.001594	5.07E-06	314.3676	0.0000
NIM	-5.32E-05	2.93E-07	-181.7653	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	5.96E-05	S.D. dependent var	0.000218
S.E. of regression	0.000336	Sum squared resid	1.85E-05
J-statistic	24.23545	Instrument rank	25
Prob(J-statistic)	0.281791		

Appendix (86): Arrellano-Bond serial correlation test results for the fourth model (Leverage risk)

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 03/07/20 Time: 10:30
Sample: 2005 2018
Included observations: 168

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	0.228854	0.000001	0.000004	0.8190
AR(2)	0.747577	0.000001	0.000001	0.4547

Appendix (87): Estimation results using PLS model for the fourth model (Liquidity risk)

Dependent Variable: LIQUIDITY
Method: Panel Least Squares
Date: 03/08/20 Time: 10:03
Sample (adjusted): 2006 2018
Periods included: 13
Cross-sections included: 25
Total panel (unbalanced) observations: 243

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.428735	0.026011	16.48263	0.0000
DERIVATIVES	0.916211	0.452636	2.024169	0.0441
SIZE	-0.051753	0.003464	-14.94018	0.0000
NIM	-0.009499	0.006042	-1.572179	0.1172

R-squared	0.482924	Mean dependent var	0.153082
Adjusted R-squared	0.476433	S.D. dependent var	0.083725
S.E. of regression	0.060581	Akaike info criterion	-2.753335
Sum squared resid	0.877154	Schwarz criterion	-2.695836
Log likelihood	338.5302	Hannan-Quinn criter.	-2.730175
F-statistic	74.40468	Durbin-Watson stat	0.658847
Prob(F-statistic)	0.000000		

Appendix (88): Estimation results using fixed effect model for the fourth model (Liquidity risk)

Dependent Variable: LIQUIDITY
Method: Panel Least Squares
Date: 03/08/20 Time: 10:07
Sample (adjusted): 2006 2018
Periods included: 13
Cross-sections included: 25
Total panel (unbalanced) observations: 243

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.487913	0.028914	16.87488	0.0000
DERIVATIVES	0.340839	0.574468	0.593312	0.5536
SIZE	-0.058245	0.003405	-17.10588	0.0000
NIM	-0.017673	0.006428	-2.749211	0.0065

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.751719	Mean dependent var	0.153082
Adjusted R-squared	0.720540	S.D. dependent var	0.083725
S.E. of regression	0.044260	Akaike info criterion	-3.289434
Sum squared resid	0.421177	Schwarz criterion	-2.886941
Log likelihood	427.6662	Hannan-Quinn criter.	-3.127314
F-statistic	24.10942	Durbin-Watson stat	1.351258
Prob(F-statistic)	0.000000		

Appendix (89): Estimation results using dual fixed effect model for the fourth model (Liquidity risk)

Dependent Variable: LIQUIDITY
Method: Panel Least Squares
Date: 03/08/20 Time: 10:10
Sample (adjusted): 2006 2018
Periods included: 13
Cross-sections included: 25
Total panel (unbalanced) observations: 243

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.455204	0.096508	4.716743	0.0000
DERIVATIVES	-0.233217	0.549562	-0.424368	0.6717
SIZE	-0.049426	0.016969	-2.912744	0.0040
NIM	-0.020062	0.007131	-2.813215	0.0054

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.807242	Mean dependent var	0.153082
Adjusted R-squared	0.770210	S.D. dependent var	0.083725
S.E. of regression	0.040135	Akaike info criterion	-3.443796
Sum squared resid	0.326989	Schwarz criterion	-2.868807
Log likelihood	458.4212	Hannan-Quinn criter.	-3.212196

F-statistic	21.79836	Durbin-Watson stat	1.465662
Prob(F-statistic)	0.000000		

Appendix (90): Estimation results using random effect model for the fourth model (Liquidity risk)

Dependent Variable: LIQUIDITY
Method: Panel EGLS (Cross-section random effects)
Date: 03/08/20 Time: 10:13
Sample (adjusted): 2006 2018
Periods included: 13
Cross-sections included: 25
Total panel (unbalanced) observations: 243
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.466097	0.028205	16.52545	0.0000
DERIVATIVES	0.572770	0.528143	1.084497	0.2792
SIZE	-0.056438	0.003257	-17.32624	0.0000
NIM	-0.015100	0.006097	-2.476560	0.0140

Effects Specification

	S.D.	Rho
Cross-section random	0.044378	0.5013
Idiosyncratic random	0.044260	0.4987

Weighted Statistics

R-squared	0.559059	Mean dependent var	0.046415
Adjusted R-squared	0.553524	S.D. dependent var	0.066916
S.E. of regression	0.044374	Sum squared resid	0.470603
F-statistic	101.0076	Durbin-Watson stat	1.214242
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.473761	Mean dependent var	0.153082
Sum squared resid	0.892697	Durbin-Watson stat	0.640111

Appendix (91): Hausman test results for the fourth model (Liquidity risk)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.552895	3	0.3140

Appendix (92): Heterosckedasticity test results for the fourth model (Liquidity risk) using Breusch-Pagan test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Liquidity

         chi2(1)      =    13.78
         Prob > chi2  =   0.0002

.
```

Appendix (93): Heterosckedasticity test results for the fourth model (Liquidity risk) using White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(9)      =     31.18
         Prob > chi2  =    0.0003

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	31.18	9	0.0003
Skewness	19.56	3	0.0002
Kurtosis	1.98	1	0.1589
Total	52.73	13	0.0000

Appendix (94): Endogeneity test results for the fourth model (Liquidity risk)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 Liquidity (Derivatives=Size) NIM , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                Obs per group: min =         4
                                                           avg =       9.7
                                                           max =        13

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      243
                                                      F(  2,   216) =     0.64
                                                      Prob > F      =   0.5289
Total (centered) SS     =  1.004992825                Centered R2   = -97.0918
Total (uncentered) SS   =  1.004992825                Uncentered R2 = -97.0918
Residual SS             =  98.58157059                Root MSE      =    .6725

------------------------------------------------------------------------------
   Liquidity |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   128.9348   113.8833     1.13   0.258    -94.27234    352.1419
         NIM |   .2569878   .2386305     1.08   0.282    -.2107194    .7246949
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           1.273
                                                   Chi-sq(1) P-val =    0.2592
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                1.269
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                             125.666
                                                   Chi-sq(1) P-val =    0.0000
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: NIM
Excluded instruments: Size
------------------------------------------------------------------------------
```

Appendix (95): Estimation results using GMM model for the fourth model (Liquidity risk)

Dependent Variable: LIQUIDITY
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/08/20 Time: 10:25
Sample (adjusted): 2008 2018
Periods included: 11
Cross-sections included: 25
Total panel (unbalanced) observations: 192
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(LIQUIDITY,-2) DERIVATIVES SIZE NIM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIQUIDITY(-1)	0.320813	0.039007	8.224498	0.0000

DERIVATIVES	-0.761069	0.206536	-3.684927	0.0003
SIZE	-0.042401	0.010468	-4.050368	0.0001
NIM	-0.035845	0.003409	-10.51487	0.0000

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.012389	S.D. dependent var	0.051972
S.E. of regression	0.054735	Sum squared resid	0.563239
J-statistic	23.87955	Instrument rank	25
Prob(J-statistic)	0.298931		

Appendix (96): Arrellano-Bond serial correlation test results for the fourth model (Liquidity risk)

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 03/08/20 Time: 10:27
Sample: 2005 2018
Included observations: 192

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-4.741543	-0.237567	0.050103	0.0000
AR(2)	1.294026	0.031719	0.024512	0.1957

Appendix (97): Estimation results using PLS model for the fourth model (Credit risk)

Dependent Variable: CREDIT_RISK
Method: Panel Least Squares
Date: 03/08/20 Time: 10:30
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.009923	0.963086	4.163620	0.0000
DERIVATIVES	6.571260	13.12399	0.500706	0.6171
SIZE	-0.607442	0.174328	-3.484482	0.0006
NIM	0.670382	0.176845	3.790788	0.0002

R-squared	0.121641	Mean dependent var	3.179041
Adjusted R-squared	0.109385	S.D. dependent var	1.716813
S.E. of regression	1.620198	Akaike info criterion	3.821070
Sum squared resid	564.3840	Schwarz criterion	3.882971
Log likelihood	-414.4072	Hannan-Quinn criter.	3.846070
F-statistic	9.924877	Durbin-Watson stat	0.309950
Prob(F-statistic)	0.000004		

Appendix (98): Estimation results using fixed effect model for the fourth model (Credit risk)

Dependent Variable: CREDIT_RISK
Method: Panel Least Squares

Date: 03/08/20 Time: 10:33
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11.93273	3.508655	-3.400941	0.0008
DERIVATIVES	-31.34830	16.77248	-1.869032	0.0631
SIZE	2.566607	0.705775	3.636580	0.0004
NIM	1.210559	0.222479	5.441228	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.548737	Mean dependent var	3.179041
Adjusted R-squared	0.484945	S.D. dependent var	1.716813
S.E. of regression	1.232111	Akaike info criterion	3.374244
Sum squared resid	289.9565	Schwarz criterion	3.807550
Log likelihood	-341.4797	Hannan-Quinn criter.	3.549243
F-statistic	8.602079	Durbin-Watson stat	0.640975
Prob(F-statistic)	0.000000		

Appendix (99): Estimation results using dual fixed effect model for the fourth model (Credit risk)

Dependent Variable: CREDIT_RISK
Method: Panel Least Squares
Date: 03/08/20 Time: 10:37
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.069655	6.734206	-0.010344	0.9918
DERIVATIVES	-21.44851	16.49848	-1.300029	0.1952
SIZE	0.136105	1.414511	0.096221	0.9235
NIM	0.962938	0.218329	4.410483	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.618975	Mean dependent var	3.179041
Adjusted R-squared	0.543607	S.D. dependent var	1.716813
S.E. of regression	1.159825	Akaike info criterion	3.287250
Sum squared resid	244.8253	Schwarz criterion	3.859833
Log likelihood	-322.9538	Hannan-Quinn criter.	3.518499
F-statistic	8.212745	Durbin-Watson stat	0.584776
Prob(F-statistic)	0.000000		

Appendix (100): Estimation results using random effect model for the fourth model (Credit risk)

Dependent Variable: CREDIT_RISK
Method: Panel EGLS (Cross-section random effects)
Date: 03/08/20 Time: 10:39
Sample (adjusted): 2006 2015
Periods included: 10
Cross-sections included: 25
Total panel (unbalanced) observations: 219
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.553334	1.494731	0.370190	0.7116
DERIVATIVES	-30.46616	14.64020	-2.080993	0.0386
SIZE	0.036111	0.286970	0.125834	0.9000
NIM	0.919839	0.194558	4.727836	0.0000

Effects Specification

	S.D.	Rho
Cross-section random	0.989221	0.3919
Idiosyncratic random	1.232111	0.6081

Weighted Statistics

R-squared	0.113161	Mean dependent var	1.218028
Adjusted R-squared	0.100786	S.D. dependent var	1.356908
S.E. of regression	1.282815	Sum squared resid	353.8070
F-statistic	9.144684	Durbin-Watson stat	0.486712
Prob(F-statistic)	0.000010		

Unweighted Statistics

R-squared	0.046004	Mean dependent var	3.179041
Sum squared resid	612.9843	Durbin-Watson stat	0.280924

Appendix (101): Hausman test results for the fourth model (Credit risk)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	21.842344	3	0.0001

Appendix (102): Heterosckedasticity test results for the fourth model (Credit risk) using Breusch-Pagan test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of CreditR

         chi2(1)      =     1.56
         Prob > chi2  =   0.2114
```

Appendix (103): Heterosckedasticity test results for the fourth model (Credit risk) using White test

```
. imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(9)      =     27.46
         Prob > chi2  =    0.0012

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	27.46	9	0.0012
Skewness	31.36	3	0.0000
Kurtosis	8.17	1	0.0042
Total	67.00	13	0.0000

Appendix (104): Endogeneity test results for the fourth model (Credit risk)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 CreditR (Derivatives=Size) NIM , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                 Obs per group: min =         4
                                                            avg =       8.8
                                                            max =        10

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      219
                                                      F(  2,   192) =     5.87
                                                      Prob > F      =   0.0033
Total (centered) SS     =  356.6647608                Centered R2   =  -1.8149
Total (uncentered) SS   =  356.6647608                Uncentered R2 =  -1.8149
Residual SS             =  1003.976637                Root MSE      =    2.275

------------------------------------------------------------------------------
     CreditR |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |  -395.0981   182.0655    -2.17   0.030      -751.94   -38.25622
         NIM |   .4945389   .4699036     1.05   0.293    -.4264553    1.415533
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           5.455
                                                   Chi-sq(1) P-val =    0.0195
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                5.555
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                              12.563
                                                   Chi-sq(1) P-val =    0.0004
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: NIM
Excluded instruments: Size
------------------------------------------------------------------------------

.
```

Appendix (105): Estimation results using PLS model for the fifth model (Cost of equity capital)

Dependent Variable: COE
Method: Panel Least Squares
Date: 03/09/20   Time: 10:08
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.255779	7.334294	0.443912	0.6578
DERIVATIVES	0.161368	1.250412	0.129052	0.8975
SIZE	0.010225	0.023986	0.426269	0.6706

LEVERAGE	-3.276251	7.428246	-0.441053	0.6599
ROA	0.026620	0.031143	0.854777	0.3942
ROE	-0.002931	0.004120	-0.711526	0.4780

R-squared	0.009395	Mean dependent var	0.041005
Adjusted R-squared	-0.027025	S.D. dependent var	0.101791
S.E. of regression	0.103158	Akaike info criterion	-1.663782
Sum squared resid	1.447243	Schwarz criterion	-1.538888
Log likelihood	124.1285	Hannan-Quinn criter.	-1.613030
F-statistic	0.257960	Durbin-Watson stat	1.688390
Prob(F-statistic)	0.935157		

Appendix (106): Estimation results using fixed effect model for the fifth model (Cost of equity capital)

Dependent Variable: COE
Method: Panel Least Squares
Date: 03/09/20 Time: 10:13
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.266099	18.39539	-0.286273	0.7752
DERIVATIVES	0.003258	2.939038	0.001109	0.9991
SIZE	-0.117147	0.142721	-0.820807	0.4135
LEVERAGE	5.862273	18.72361	0.313095	0.7548
ROA	0.024256	0.058623	0.413765	0.6798
ROE	-0.003770	0.008533	-0.441763	0.6595

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.031851	Mean dependent var	0.041005
Adjusted R-squared	-0.218830	S.D. dependent var	0.101791
S.E. of regression	0.112378	Akaike info criterion	-1.348684
Sum squared resid	1.414436	Schwarz criterion	-0.724214
Log likelihood	125.7566	Hannan-Quinn criter.	-1.094925
F-statistic	0.127058	Durbin-Watson stat	1.721275
Prob(F-statistic)	1.000000		

Appendix (107): Estimation results using dual fixed effect model for the fifth model (Cost of equity capital)

Dependent Variable: COE
Method: Panel Least Squares
Date: 03/09/20 Time: 10:17
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.739580	19.15036	-0.404148	0.6869

DERIVATIVES	-0.232750	3.084737	-0.075452	0.9400
SIZE	-0.281414	0.322361	-0.872977	0.3846
LEVERAGE	9.128262	19.81842	0.460595	0.6460
ROA	-0.022152	0.070281	-0.315188	0.7532
ROE	0.000595	0.009205	0.064630	0.9486

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.052678	Mean dependent var	0.041005
Adjusted R-squared	-0.248341	S.D. dependent var	0.101791
S.E. of regression	0.113731	Akaike info criterion	-1.300008
Sum squared resid	1.384009	Schwarz criterion	-0.571459
Log likelihood	127.3006	Hannan-Quinn criter.	-1.003955
F-statistic	0.174998	Durbin-Watson stat	1.726818
Prob(F-statistic)	1.000000		

Appendix (108): Estimation results using random effect model for the fifth model (Cost of equity capital)

Dependent Variable: COE
Method: Panel EGLS (Cross-section random effects)
Date: 03/09/20 Time: 10:21
Sample (adjusted): 2010 2015
Periods included: 6
Cross-sections included: 25
Total panel (unbalanced) observations: 142
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.255779	7.989867	0.407488	0.6843
DERIVATIVES	0.161368	1.362180	0.118463	0.9059
SIZE	0.010225	0.026130	0.391293	0.6962
LEVERAGE	-3.276251	8.092217	-0.404864	0.6862
ROA	0.026620	0.033926	0.784642	0.4340
ROE	-0.002931	0.004488	-0.653145	0.5148

Effects Specification

	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.112378	1.0000

Weighted Statistics

R-squared	0.009395	Mean dependent var	0.041005
Adjusted R-squared	-0.027025	S.D. dependent var	0.101791
S.E. of regression	0.103158	Sum squared resid	1.447243
F-statistic	0.257960	Durbin-Watson stat	1.688390
Prob(F-statistic)	0.935157		

Unweighted Statistics

R-squared	0.009395	Mean dependent var	0.041005
Sum squared resid	1.447243	Durbin-Watson stat	1.688390

Appendix (109): Heterosckedasticity test results for the fifth model (Cost of equity capital) using Breusch-Pagan test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of COE

         chi2(1)      =    20.45
         Prob > chi2  =   0.0000
```

.

Appendix (110): Heterosckedasticity test results for the fifth model (Cost of equity capital) using White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(20)     =     36.13
         Prob > chi2  =    0.0149

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	36.13	20	0.0149
Skewness	2.24	5	0.8154
Kurtosis	1.51	1	0.2191
Total	39.87	26	0.0401

Appendix (111): Endogeneity test results for the fifth model (Cost of equity capital)

Note: Due to the large number of the estimation results of the endogeneity test, we only insert one model of estimation results.

```
. xtivreg2 COE (Derivatives=Size) Leverage ROA ROE , fe endog(Derivatives)

FIXED EFFECTS ESTIMATION
------------------------
Number of groups =        25                  Obs per group: min =         4
                                                             avg =       5.7
                                                             max =         6

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                      Number of obs =      142
                                                      F(  4,   113) =     0.23
                                                      Prob > F      =   0.9183
Total (centered) SS     =  1.427631301                Centered R2   =  -0.1125
Total (uncentered) SS   =  1.427631301                Uncentered R2 =  -0.1125
Residual SS             =  1.588202493                Root MSE      =    .1165

------------------------------------------------------------------------------
         COE |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
 Derivatives |   10.90526   13.42891     0.81   0.417    -15.41493    37.22545
    Leverage |   .0692967   17.06064     0.00   0.997    -33.36895    33.50755
         ROA |   .0674027   .0745999     0.90   0.366    -.0788104    .2136158
         ROE |  -.0097203   .0109424    -0.89   0.374     -.031167    .0117264
------------------------------------------------------------------------------
Underidentification test (Anderson canon. corr. LM statistic):           5.729
                                                   Chi-sq(1) P-val =    0.0167
------------------------------------------------------------------------------
Weak identification test (Cragg-Donald Wald F statistic):                5.818
Stock-Yogo weak ID test critical values: 10% maximal IV size             16.38
                                         15% maximal IV size              8.96
                                         20% maximal IV size              6.66
                                         25% maximal IV size              5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
------------------------------------------------------------------------------
Sargan statistic (overidentification test of all instruments):           0.000
                                                 (equation exactly identified)
-endog- option:
Endogeneity test of endogenous regressors:                               0.700
                                                   Chi-sq(1) P-val =    0.4029
Regressors tested:    Derivatives
------------------------------------------------------------------------------
Instrumented:         Derivatives
Included instruments: Leverage ROA ROE
Excluded instruments: Size
------------------------------------------------------------------------------
```

Appendix (112): Estimation results using GMM model for the fifth model (Cost of equity capital)

Dependent Variable: COE
Method: Panel Generalized Method of Moments
Transformation: First Differences
Date: 03/09/20 Time: 10:40
Sample (adjusted): 2012 2015
Periods included: 4
Cross-sections included: 25
Total panel (unbalanced) observations: 98
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(COE,-2) DERIVATIVES SIZE LEVERAGE ROA ROE

Variable	Coefficient	Std. Error	t-Statistic	Prob.

COE(-1)	0.232693	0.003633	64.05107	0.0000
DERIVATIVES	-9.759452	0.289265	-33.73879	0.0000
SIZE	-0.145733	0.050340	-2.894988	0.0047
LEVERAGE	2.396839	3.166406	0.756959	0.4510
ROA	-0.060711	0.014926	-4.067550	0.0001
ROE	0.006615	0.002306	2.868717	0.0051

Effects Specification

Cross-section fixed (first differences)

Mean dependent var	-0.008096	S.D. dependent var	0.137179
S.E. of regression	0.147222	Sum squared resid	1.994045
J-statistic	14.13925	Instrument rank	15
Prob(J-statistic)	0.117457		

Appendix (113): Arrellano-Bond serial correlation test results for the fifth model (cost of equity capital)

Arellano-Bond Serial Correlation Test
Equation: Untitled
Date: 03/09/20 Time: 10:43
Sample: 2005 2018
Included observations: 98

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-1.115127	-0.778402	0.698039	0.2648
AR(2)	1.026844	0.176585	0.171968	0.3045

Abstract:

After the globalization and markets integration, many changes have influenced both financial and banking sectors. Hence, in order to adapt with these changes the derivative instruments were created and they knew a rapid growth. Using the annual data of 25 commercial banks from GCC countries covering the whole period from 2006 to 2018 additionally to daily market data during the period 2010 to 2018, the objective of this thesis is to investigate mainly whether the use of financial derivatives makes banks reducing their cost of equity capital. In addition, this thesis also examines the effect of financial derivatives usage on both performance and risk of banks. Main results reveal that the use of derivative instruments lowers both performance and risk of commercial banks. Moreover, findings also show that the cost of equity capital in commercial banks is reduced due to the use of financial derivatives by these banks.

Keywords: Derivative instruments, performance of banks, bank risks, cost of equity capital, Panel data analysis.

الملخص:

لقد تأثر كلا من القطاع المالي و القطاع البنكي بعد التغيرات التي سببتها العولمة و تكامل الأسواق المالية، و للتأقلم مع هذه التغيرات ظهرت المشتقات المالية و زاد استعمالها عبر السنوات. باستعمال بيانات سنوية من 2006 إلى 2018 ل 25 بنك تجاري من دول الخليج بالإضافة إلى بيانات أسعار السوق اليومية خلال الفترة 2010 إلى 2018، تهدف هذه الأطروحة إلى معرفة إذا كان استعمال المشتقات المالية يخفض من تكلفة الأموال الخاصة في البنوك بالإضافة إلى دراسة تأثير استعمال المشتقات المالية على أداء و مخاطر البنوك. تظهر نتائج الدراسة أن استعمال المشتقات المالية من طرف البنوك التجارية يؤدي إلى تخفيض المخاطر التي تواجهها هذه البنوك ولكن في نفس الوقت يقلل من أدائها. كما تظهر النتائج أن تكلفة الأموال الخاصة في البنوك التي تستعمل المشتقات المالية قليلة.

الكلمات المفتاحية: المشتقات، أداء البنوك، مخاطر البنوك، تكلفة الأموال الخاصة، بيانات بانل.

Résumé:

Après la mondialisation et l'intégration des marchés, de nombreux changements ont influencé les deux secteurs financier et bancaire. En réponse à ces changements, les instruments dérivés ont été créés connaissant par la suite une croissance rapide. Dans cette thèse, notre objectif est double, en effet nous visons à examiner en premier lieu si l'utilisation des dérivés financiers permettrait de réduire les couts des fonds propres des banques commerciales, et en deuxième lieu l'effet de leur utilisation sur la performance et le risque de ces institutions ; et ce en utilisant à la fois les données annuelles de 25 banques commerciales des pays du golfe couvrant toute la période allant de 2006 à 2018, et des données de marché quotidiennes au cours de la période 2010 à 2018. Les principaux résultats révèlent que l'utilisation d'instruments dérivés réduit à la fois la performance et le risque des banques commerciales. En outre, les résultats montrent également que le coût des fonds propres des banques commerciales est réduit en raison de l'utilisation des dérivés par ces banques.

Mot clés: instruments dérivés, performance des banques, risques bancaires, coût des fonds propres, analyse des données de Panel.